124 YEARS OF PASTEUR INSTITUTE NIŠ

56th DAYS OF PREVENTIVE MEDICINE

INTERNATIONAL CONGRESS

BOOK OF ABSTRACTS

24-27. 09. 2024.
NIŠ, SERBIA

ORGANISED BY

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The theme of the Congress:

Health Inequalities: Challenges for Public Health

MAIN TOPICS

Theoretical and practical problems of non-communicable diseases
Theoretical and practical problems of communicable diseases
Challenges of organizing healthcare services
Health promotion in the youth population
Application of information and communication tools in the health care system
Nutrition and Health
Environment and Health
Microbiology Today
The current state of antibiotic resistance
Current parasitosis

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PLENARY LECTURE

THE ROLE OF LIFESTYLE INTERVENTIONS IN THE PREVENTION AND TREATMENT OF CHRONIC DISEASES

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Objectives: Chronic non-communicable diseases (NCDs) including cardiovascular diseases, cancers, diabetes mellitus and chronic respiratory diseases are the leading causes of morbidity and mortality worldwide. The common modifiable lifestyle-related risk factors of NCDs, such as unhealthy diet, smoking, heavy alcohol consumption and physical inactivity are well-known. This study aims to show 1) the changing patterns of NCDs and the related lifestyle factors, 2) the effectiveness of healthy lifestyle interventions applied at different levels of prevention, and 3) the role of lifestyle medicine as a solution to reduce the burden of chronic diseases.

Methods: Epidemiological data about deaths, disability-adjusted life years (DALYs) and risk factors were obtained from the database of Global Burden of Disease (GBD) study delivered by the Institute of Health Metrics and Evaluation (IHME). The literature search was performed using MEDLINE (via PubMed) for relevant articles focusing on the reviews of lifestyle interventions.

Results: Although evidence-based recommendations are available about healthy diet, alcohol consumption, physical activity, and health damaging effect of tobacco use, NCDs kill 41 million people each year. There is an increasing number of studies about the effectiveness of lifestyle interventions for the prevention and treatment, the majority of these programs focused on type 2 diabetes, prediabetes, overweight/obesity, cardiovascular diseases, or NCDs in general. These studies showed that intensive lifestyle interventions related to diet and physical activity significantly improved health outcomes (e.g. reduced HbA1c, blood pressure, or increased HDL-Ch in diabetic patients). The combination of weight loss, healthy eating and physical activity markedly reduced the risk of type 2 diabetes. Additionally, personalized goals and behavioural therapy/counselling (including the 5A model) across the lifespan can significantly facilitate the behaviour change.

Conclusion: The prevention and treatment of lifestyle-related diseases is a complex process, including not only nutritional, exercise and substance use related interventions, but psychological, social, economic and environmental interventions, too.

Patients highly appreciate recommendations given by their physicians, that's why healthcare professionals must become the promoters of healthy lifestyle. Additionally, the implementation of lifestyle medicine as a branch of evidence-based medicine can be used to prevent, treat and reverse the progression of chronic diseases by addressing the underlying lifestyle factors.

Key words: lifestyle, prevention, diet, physical activity

SESSION: NUTRITION AND HEALTH

INVITED LECTURES

PROBIOTICS: LEGISLATIVE FRAMEWORK, HEALTH BENEFITS AND RISKS

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Probiotics have been defined as "*live microorganisms which when administered in adequate amounts confer a health benefit on the host*". Despite this definition and widespread and rapidly growing use of probiotics, there remains uncertainty regarding their efficacy and conflicting recommendations about their use. In addition, enlargement and broadening of microbiological and multidisciplinary research on microbiome metabolites and their distant health effects contributes to the complexity of the definition of probiotic strains. The definition has been widely adopted by regulators, consumers and industry but will evolve over time as innovations will lead to the next generation of probiotics (NGP) isolated from novel sources, with novel health benefits, safety and efficacy issues.

In Europe, probiotics are primarily regulated as food supplements or as part of functional foods, rather than medicinal products. This regulatory approach reflects the European Union's (EU) stance on probiotics as substances intended to maintain or improve health rather than to treat or prevent diseases in a medicinal context. Characteristics of probiotics must include Qualified Presumption of Safety (QPS) at the species level by the European Food Safety Authority (EFSA); targeting general sub-health population people; isolated from gut; breast milk and fermented foods; have long history of use and belong to limited genera. However, criteria typically include several key elements to qualify microorganisms as probiotic: probiotic strains must be sufficiently characterized, safe for the intended use, supported by at least one positive human clinical trial conducted according to generally accepted scientific standards; and alive in sufficient numbers in the product at an efficacious dose throughout shelf life.

Probiotics by definition must have health benefits to host. Health benefits are often strain-specific; some benefits may be driven by common, shared mechanisms and may therefore be generalizable.

The regulation of probiotic foods and their health claims in the European Union (EU) is quite stringent and governed by General Food Law and the Nutrition & Health Claims Regulation 1924/2006 (NHCR). Except one approved health claim (on live yoghurt cultures and improved lactose digestion for the microorganisms), no health claim on probiotics has been authorized by EFSA due to a lack of sufficient scientific evidence demonstrating health benefits. Even the term 'probiotic' is considered by the European Commission as a health claim per se. The misuse of the term probiotic thus has become a significant regulatory issue, with many products using the term without meeting the requisite criteria and causing legal uncertainty and consumer confusion. The clarification of the term 'probiotic' will facilitate ongoing advances in probiotic research and ensure that the benefits of probiotics are accurately communicated to consumers.

Key words: Probiotics, Regulatory framework, Health claims, Food Supplements

OBESITY AND MALIGNANCY: PATHOPHYSIOLOGY AND CLINICAL IMPLICATIONS

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The occurrence of obesity has increased across the whole world. Many epidemiological studies have indicated that obesity strongly contributes to the development of cancer, accounting for a heavy burden on the public and healthcare systems every year. Obesity is known to be associated with 13 types of cancer (breast, uterine, ovarian, esophageal, colorectal, etc) with a significant increase in the incidence of obesity-related cancers among young adults (25-49 years).

The association of obesity with cancer is biologically complex. Many studies have indicated that obesity-related effects on DNA damage and repair pathways may be involved in obesity-induced genetic instability due to the formation of reactive oxygen species (ROS). Oxidation modification of DNA induces genetic instability due to its mutagenic potential. In obese individuals, excessive accumulation of triglycerides in adipocytes results in enhanced mitochondrial β-oxidation of free fatty acid and increased mitochondrial ROS generation, which drives the accumulation of genomic damage, reduces the efficacy of DNA repair and enhances the competitiveness of tumor cells by regulating particular intracellular molecular networks. The circulating pro-inflammatory cytokines are known to induce the production of ROS, and this may accelerate the mutational rate of cells and interfere with DNA repair mechanisms leading to an increase and accumulation of genetic events. Furthermore, adipocyte hypertrophy in tissue leads to ischemia and hypoxia, which can cause a greater state of oxidative stress and release of ROS to induce mitochondrial dysfunction and damage DNA. The obesity-associated conditions of hyperglycemia, hyperlipidemia, and hyperinsulinemia lead to increased ROS formation, exacerbating the inflammatory process in obesity. Nevertheless, the most prominent mechanisms involved in obesity-induced cancers are dysregulation of adipokine secretion (leptin/adiponectin dysfunction), hyperinsulinemia, chronic low-grade inflammation, and hyperestrogenemia. These mechanisms collectively induce oncogenic mutations in a normal cell, conferring clonal advantage as the initial event, their transformation into cancer cells, and represent drivers for the progression and invasion.

Obesity prepares cells for all aspects of tumorigenesis (stimulating cell growth and proliferation, de-differentiation, the release of tumor cells from tissues, providing vessels for their dispersal, and providing a final niche for their growth). As obesity is related to aggressive disease, metastasis, and short survival in a number of cancer types, there is a need for the prioritization of efforts to acknowledge the pathophysiology of obesity-associated cancers. Weight-intervention measures or other dietary approaches that are relatively low cost, and could reduce tumorigenesis in obesity need greater consideration by public health bodies as the psychological burden of cancer carries significant personal and public health costs.

Keywords: obesity, cancer, hyperinsulinemia, adipokines, low-grade inflammation

ORAL PRESENTATIONS

ADVANCED TECHNOLOGIES IN THE TREATMENT OF TYPE 1 DIABETES AND IMPORTANCE FOR PATIENT DIET

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Insulin pumps (CSII- continuous subcutaneous insulin infusion) are small, portable, computer-programmed devices that deliver insulin in very precise amounts and at precisely defined intervals. Only fast-acting insulin analogues are used in insulin pumps. CSII is the therapy regimen that is closest to the physiological insulin secretion. This therapy provides less glycemic variability, also enables greater flexibility in diet and physical activity and improves the quality of life of patients. The best results are achieved with motivated and well-educated patients. New generations of insulin pumps bring additional advantages that make everyday life easier. This primarily refers to the sensor augmented pumps (SAP), that can stop the delivery of insulin in case of hypoglycemia (low blood sugar), and more modern pumps with the help of complex algorithms can predict the coming hypoglycemia and stop the delivery of insulin before it occurs, and finally there are insulin pumps that even autonomously participate in the regulation of hyperglycemia (closed-loop insulin pumps).

Continuous glucose monitoring (CGM) - CGM devices continuously measure the glucose level in the interstitial fluid of the subcutaneous tissue (which correlates well with the blood sugar level). They consist of a sensor located in the subcutaneous tissue, a monitor (reader), which can be a separate device, integrated with a pump or a mobile phone, and a transmitter that connects these two parts. The sensors measure the glucose level every 5 minutes for 7-15 days. The use of CGM is especially indicated in patients on CSII, in preconception and pregnancy, in patients with frequent or unrecognized hypoglycemia or with poor glycemic control despite intensive therapy, in case of suspicion of dawn phenomenon, etc. CGM devices represent a technology that has significantly improved the regulation of diabetes and the quality of life of patients with diabetes, especially type 1 diabetes. The key data on CGM are time in range (TIR), time below range (TBL) and time above range (TAR). TIR is defined as the time the patient spends in the desired range of glycemia (3.9-10.0 mmol/l) and for the average patient the target value of this parameter is >70%, but special targets can be set for certain categories of patients (elderly, high-risk, pregnant women, etc.). Personalized diet that uses recent progress of technology such as sensors can better improve metabolic status in diabetic patients**.**

THE SIGNIFICANCE OF DETERMINING BODY COMPOSITION USING RADIOLOGICAL EXAMINATION MODALITIES IN PREDICTING THE DEVELOPMENT (AND SURVIVAL) OF DIFFERENT DISEASES

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Objectives: In addition to traditional body composition measuring, imaging modalities that include DEXA, CT, MRI, and PET CT can be used. On the other hand, numerous studies link the measurement of body composition with metabolic, inflammatory and malignant diseases. In this paper, we will present current imaging modalities available for the assessment of body composition and studies on the clinical applicability of obtained data.

Materials and methods: Literature review following key words: ct, mri, body composition, clinical applications, disease correlation

Results: Body composition assessed with imaging modalities affects multiple cancer-related outcomes, including treatment toxicity, response to therapy, complications, and prognosis-survival. Greater muscle mass is associated with longer survival time. Decrease of muscle mass is associated with longer duration of hospitalization and higher mortality.

A low level of visceral adipose tissue is a marker of shorter survival in hospitalized and operated patients, while high level is associated with metabolic diseases and a predictor of coronary artery stenosis in asymptomatic patients.

Conclusion: Advances in technology have led to an abundance of available data, however, the lack of standardized cutoffs for classifying abnormal muscle mass or adiposity has been a barrier to widespread adoption of these measurements in research and clinical practice.

Key words: CT, MRI, body composition, clinical applications, disease correlation

POSTER PRESENTATIONS

NUTRITION AWARENESS AND OBESITY IN MEDICAL VS. NON-MEDICAL PERSONNEL: A CROSS-SECTIONAL STUDY IN A TERTIARY HEALTHCARE FACILITY

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Objectives: The aim of this study was to compare the nutritional knowledge between medical and non-medical personnel of a tertiary healthcare institution and to assess its impact on the anthropometric and health status.

Materials and methods: A cross-sectional study included 200 subjects divided into groups of medical and non-medical personnel (secondary school or college education) and equal gender distribution.

Data were collected through an individually completed questionnaire. Anthropometric status was analyzed by measuring height and waist circumference, followed by determining body composition using InBody 720 system (InBody, Seoul, South Korea).

Results: Non-medical personnel have a significantly higher risk of being overweight and obese (OR=2.59, p=0.003). Women have a significantly lower risk of being overweight and obese (OR=0.42, p=0.006). The total score from the nutrition questionnaire was not found to be a statistically significant predictor of overweight and obesity, although a subgroup with lowest body mass index (female medical staff) achieved the highest results in the knowledge questionary.

Conclusion: Females and medical personnel possess better knowledge and habits related to nutrition as well as better anthropometric characteristics, and develop overweight and obesity less frequently. Further studies are needed to estimate the role of nutritional knowledge in the prevention of obesity.

Key words: nutrition, survey, anthropometric status, health, healthcare personnel

KNOWLEDGE AND AWARENESS OF NON-CELIAC GLUTEN SENSITIVITY AMONG STUDENTS OF THE FACULTY OF SPORT AND PHYSICAL EDUCATION, UNIVERSITY OF NIS

Stefan Mijalković[1], Stefan Stojanović[1], Ana Lilić[1], Ljiljana Bjelaković[1]

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Objectives: Non-celiac gluten sensitivity (NCGS) is a newly recognized condition that often goes unnoticed but can impact health and athletic performance. Symptoms include abdominal discomfort, bloating, diarrhea, constipation, headaches, tingling, muscular issues, fatigue, and joint or bone pain. Therefore, the aim of this study was to determine the awareness of non-celiac gluten sensitivity among students of the Faculty of Sport and Physical Education.

Materials and methods: Sixty students from the Faculty of Sport and Physical Education, University of Niš participated in this study, comprising 57 male and 3 female respondents, with an average age of 20±1 years. The respondents completed a questionnaire on knowledge and awareness of non-celiac gluten sensitivity.

Results: According to the results of our study, 24 students (40%) responded affirmatively to the first question, stating that they had heard of non-celiac gluten sensitivity. On the second question, two students answered correctly and listed two symptoms, one student mentioned one symptom, while the rest either did not know the answer or answered incorrectly. Finally, regarding whether non-celiac gluten sensitivity can affect athletic performance, 30 students responded affirmatively or provided the correct answer. Namely, Bjelaković & Vuković-Mirković (2015) found that 93% of students at the Faculty of Sport and Physical Education did not know what NCGS is or its symptoms. It can be said that over time, students have become more familiar with this health issue.

Conclusion: Although some students were familiar with NCGS, there is a need for better understanding of its symptoms and impact on athletic performance. Improving education on this topic could benefit students' well-being and performance. Therefore, incorporating NCGS into the Faculty of Sport and Physical Education curriculum is important to ensure students are well-informed and prepared to manage this condition effectively.

Key words: gluten intolerance, students, sports performance, health

BREAKFAST CONSUMPTION AND ITS ASSOSIATION WITH ANTROPOMETRICALY DETERMINED NUTRITIONAL STATUS AMONG STUDENTS OF MEDICAL FACULTY, UNIVERSITY OF NIŠ

Bojana Vuković Mirković[1,2], Dušica Stojanović[1,2], Maja Nikolić[1,2], Aleksandra Stanković[1,2], Ljiljana Stošić[1,2]

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Breakfast is considered the most important meal of the day, and the frequency of breakfast intake is associated with maintaining adequate body weight and health in general.

The aim of this study was to examine the frequency of breakfast intake and its association with the nutritional status of students.

Methods: This pilot study was conducted among 113 students of the Faculty of Medicine, University of Niš in the period from October to December 2023 by conducting a 24-hour recall diet questionaries' for 3 days (1 weekend and two working days). Weight and height were measured using standard protocol and then body mass index (BMI) was calculated. Overweight and obesity were defined as BMI$\geq$25 kg/m^2 and BMI$\geq$30 kg/m^2, respectfully

Results: Mean age of students participating the study was 24,1±0,7 years. The largest number of students (n=90, 79.65%) belonged to the group of normally nourished, 7 were malnourished (6.19%) and 16 had overweight/obesity (14.16%). Out of the total number of students, 10 female students (8.84%) and 6 male students (6.19%) skipped breakfast. Among those who skipped breakfast, 8 female (80%) and 5 (83.33%) male students were overweight/obese.

Conclusions: Breakfast skipping was associated with odds of overweight and obesity among students.

Key words: nutritional status, overweight, students

RESULTS OF LONGITUDINAL MONITORING OF ELEMENTARY SCHOOL PUPILS

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Objectives: Long term monitoring of the growth and development of pupils is a reliable way to determine the physical body characteristics and possible disorders in the nutritional status of children of primary school age. Early school age is very important periods of life for the growth and development of the organism, where improper nutritional status, like malnutrition and obesity, can leave far-reaching consequences.
The aim of the research was longitudinal monitoring of nutritional status of pupils in selected primary schools in Novi Sad.

Materials and methods: The survey was conducted in eight year period on a sample of pupils whose parents gave their written consent for the participation of their children in the research. During the mentioned period, students' body height, body mass, thickness of skin folds at two standardized points were measured, as well as systolic and diastolic blood pressure.

Results: The statistical analysis of the obtained data determined that physiologically nourished students were from 37.0% to 65.9%, in relation to age and gender categories. The average values of skinfold thickness ranged from 12.7mm to 17.7mm over m. triceps brachii and from 8.8mm to 15.4mm above the angle of the scapula. Physiological blood pressure values were measured in 82.8% to 100% of students, depending on age and gender.

Conclusion: The presented results emphasize the need for continuous monitoring of the physical characteristics and nutritional status of all pupils. Also, it is necessary to include long-term multidisciplinary programs and activities in school curricula, in order to create desirable eating and other habits among children, in order to prevent the occurrence of non-communicable diseases, especially in later periods of life.

Key words: longitudinal monitoring, pupils, nutritional status, skinfold thickness, blood pressure

NUTRITIONAL QUALITY OF FOOD IN KINDERGARTENS IN THE PERIOD OF 2014-2023 IN NORTH MACEDONIA

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Objectives: Healthy and attractive kindergarten meals should encourage children to develop healthy eating habits. Regular monitoring of children's nutrition in kindergartens is important for promoting these habits. This study aimed to examine the nutritional quality of kindergarten meals (macronutrients) in the period of 2014-2023 in North Macedonia.

Methods: As part of the National Annual Public Health Program, the Centers of Public Health in North Macedonia analyzed the nutritional quality of meals in kindergartens within their territories. Menus from kindergartens were analyzed on their macronutrient content using digital nutritional assessment tools. The Institute of Public Health collected and analyzed the data.

Results: From 2014-2023, the average daily energy intake in investigated samples was 995 kcal, with a range from 899 to 1029 kcal. Proteins were consumed at 35 g/day, accounting for 14% of the average daily energy value. Fats were 34 g/day, with saturated fats at 12 g/day. Carbohydrates were 150 g/day (60%), including 50 g/day of monosaccharides.

Conclusion: The nutritional quality of meals in kindergartens do not meet the recommended energy requirements of 1200 kcal. Saturated fats at 11% are above recommended levels, and content of monosaccharides is twice (20%) the required amount compared to the recommended intake. These findings suggest that dietary adjustments are needed to align with nutritional guidelines and improve the overall quality of meals provided to children in these settings.

Keywords: macronutrients, children nutrition, nutritional quality, nutrition requirements

NUTRITIONAL QUALITY OF FOOD IN HOSPITALS IN NORTH MACEDONIA: 10-YEAR REVIEW

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Objectives: Ensuring that hospital menus meet patient needs is crucial for improving hospital food quality. Providing nutritious and appetizing food is essential for effective hospital treatment. This study aimed to examine the biological quality of hospital nutrition (macronutrients) in the period 2014-2023 in North Macedonia.

Methods: As part of the National Annual Public Health Program, the Centers of Public Health in North Macedonia analyzed the nutritional quality of hospital meals in the following hospitals in North Macedonia: General Hospital-Kumanovo, General Hospital-Kochani, General Hospital-Ohrid, General Hospital-Strumica, General Hospital-Veles, General Hospital „Borka Taleski" -Prilep, Clinical Center, "Mother Theresa"-Skopje, Clinical Hospital-Shtip, Clinical Hospital-Tetovo, Clinical Hospital ,"Dr.Trifun Panovski"-Bitola. Menus from hospitals were analyzed on their macronutrient content using digital nutritional assessment tools. The Institute of Public Health collected and analyzed the data.

Results: The average daily energy intake was below the 2300 kcal recommendation. Saturated fats and monosaccharides make up more than 10% of total energy, exceeding recommended levels. From 2014-2023, the average daily energy value of meals which include breakfast, lunch, snack and dinner in the above mentioned hospitals was 2035 kcal, with a range from 1957 to 2142 kcal. In this period, average protein intake was 16.4% of energy (84 g/day), fats made up 33.6% of energy (76 g/day), and saturated fats were 27 g/day. Carbohydrates accounted for 50% of energy (255 g/day), including 58 g/day of monosaccharides.

Conclusion: The content of all macronutrients increased over the 10-year period, with a slight decrease in monosaccharides. Despite improvements in macronutrient content over the decade, substantial variability in the biological quality of hospital meals highlights the need for more consistent adherence to nutritional guidelines.

Keywords: macronutrients, hospital, nutritional quality, nutrition requirements

FRAUD NOTIFICATIONS IN EUROPE RELATED TO FOOD FROM JANUARY TO JUNE 2024

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Objectives: The aim was to present notification results of suspect fraud food in European Union in period January-June 2024.

Materials and methods: The Reports on EU AGRI-FOOD fraud suspicions from January 2024 to June 2024 was searched for 31 food categories.

Results: From January 2024 to June 2024, 4699 IRASFF notifications were found for 31 food categories of which 1827 are suspicions. In 208 of 1827 cases (11.4%) product tempering (unapproved process, undeclared process, removal of a substance which should have been present in the product, adulteration (dilution, addition, substitution) were the reasons for non-compliances with fraud suspicion. In 304 of 1827 cases (16.6%) record tempering (changing the explicit product claims so they no longer match the known characteristics of the products) and in 1312 of 1827 cases (71.8%), other non-compliances (implicit claim violations contravening non-stated claims) were the reasons for non-compliances with fraud suspicion, respectively.

Conclusion: In most cases non-compliances related to the implicit claim violations contravening non-stated claims are present followed with record and product tempering. These non-compliances are not confirmed frauds but they have the aim to inform authorities and operators about fraud suspicions or deceptive practices and ensures that food is safe for consumers.

Key words: food, fraud, notification, non-compliance, RASFF

FRAUD NOTIFICATIONS IN EUROPE RELATED TO DIETARY SUPPLEMENTS FROM JANUARY TO MAY 2024

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Objectives: The aim was to present notification results of suspect fraud dietary supplements in European Union in period January-May 2024.

Materials and methods: The Reports on EU AGRI-FOOD fraud suspicions from January 2024 to May 2024 was searched for dietetic foods, food supplements and fortified foods category.

Results: From January 2024 to May 2024, 196 notifications were found for dietetic foods, food supplements and fortified foods (174 of 196 are dietary supplements). In 21 of 196 cases (10.7%) product tempering (unapproved process, undeclared process, removal of a substance which should have been present in the product, adulteration (dilution, addition, substitution) were the reasons for non-compliances with fraud suspicion. In 46 of 196 cases (23.5%) record tempering (changing the explicit product claims so they no longer match the known characteristics of the products) and in 129 of 196 cases (65.8%), other non-compliances (implicit claim violations contravening non-stated claims) were the reasons for non-compliances with fraud suspicion, respectively.

Conclusion: The 'non-compliances' are not confirmed frauds but contribute alerting and triggering investigations by competent authorities and have the aim to inform authorities and operators about fraud suspicions or deceptive practices and ensures that food is safe for consumers which leads to the highest level of human health protection.

Key words: food, fraud, notification, non-compliance, supplement

AFLATOXIN M_1 IN COW, SHEEP AND GOAT RAW MILK FROM THE REGION OF SOUTHEASTERN SERBIA

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Objectives: From the aspect of frequency of occurrence and negative impact on human and animal health, aflatoxins represent the best-known and most risky group of mycotoxins. Aflatoxin M_1 (AFM_1) is a hepatocarcinogenic derivative of aflatoxin B_1 excreted into the milk after ingestion of contaminated feed. The presence of AFM_1 in milk and milk products is of huge concern for human health. According to the current Regulation of the maximum permissible residues in food and feed, the maximum permissible AFM_1 concentration in milk is 0.25 µg /kg.

The aim of paper was to provide an overview of the AFM_1 concentration in cow, sheep and goat raw milk from the southeastern Serbia region during the period 2016-2023.

Materials and methods: Retrospective analysis of data on tested samples of cow, sheep and goat raw milk at ATM_1 was done during the period 2016-2023 in the region southeastern Serbia. The aflatoxin concentration was determined by the accredited method according to the instructions of the ELISA kit manufacturer.

Results: During the period 2016-2023, 3107 samples of raw milk were examined, mainly cow (3010 samples), goats (72 samples) and sheep (25 samples). The concentration of the AFM_1 examined samples was in the range prescribed by the Regulations on the maximum permitted concentrations, and only three samples had a concentration of greater AFM_1 0.25 µg /kg. The highest number of samples (2790 or 89.80%) had an AFM1 concentration lower than 0.05 µg /kg. The AFM1 concentration ranging from 0.05 to 0.25 µg /kg was determined in 314 or 10.11%, and only 3 samples (0.09%) had an AFM1 concentration higher than 0,25 µg /kg.

Conclusion: In the southern part of Serbia there are just few large dairy cattle farms and major part of milk is produced on individual farms with small number of cattle. For this reason, milk quality and concentration of AFM_1 are uneven. The AFM1 concentration in 99.91% of the cow, sheep and goat raw milk samples from southeastern Serbia, which were tested during the 2016-2023 period, was lower than 0.25 µg /kg, and in line with the Regulation of the maximum permissible residues in food and feed.

Key words: aflatoxin M_1, raw milk, southern Serbia

EVALUATION OF TRACE AND MACRO ELEMENTS IN HONEY FROM DIFFERENT REGIONS OF SERBIA

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Objectives: The concentrations of 17 elements in four types of honey (multifloral honey, acacia honey, rapeseed honey, and sunflower honey) collected in seven different regions of Serbia were determined to assess their mineral content, nutritional potential and safety for consumption.

Materials and methods: Samples were prepared by acid-assisted microwave digestion, and elemental content was determined by inductively coupled plasma optical emission spectroscopy (ICP-OES) and graphite furnace atomic absorption spectrometry (GFAAS).

Results: The content of the most abundant elements follows the order K > Ca > Na > Mg > Fe. The concentrations of aluminum, Zn and Cr vary in the ranges 2.38 - 16.96, 0.675 - 2.294, and 1.499-2.386 mg/kg, respectively. Copper and cadmium were only detected in three samples, and the concentrations of Pb, Ni and Se were below the method detection limit (0.010 mg/kg for Pb and Se, and 0.5 mg/kg for Ni) in all honey tested.

Conclusion: Significant differences in elemental concentrations between honey samples indicate that their mineral composition is influenced by botanical and geographical origin. The results obtained show indicate that all examined honeys meet the criteria set by the European Commission Regulation. According to Serbian legislation, the Fe and Cu content in some samples exceeds the recommended limits, which indicates the need for better control of honey production and storage.

THE POSSIBILITY OF USING BEE BREAD FOR HEALTH BENEFITS

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Objectives: Consideration of the potential benefits of the natural bee product bee bread (perga) for human health.

Materials and methods: Data were collected and analyzed from scientific database PubmMed and scientific papers.

Results: Bee bread is a natural product of pollen and nectar fermentation. The the main components of bee bread are: amino acids, sugars, fatty acids, vitamins (A, E, B1, B2, C), polyphenols and minerals. In vitro studies on the bioactive effects of bee bread have shown an antioxidant effect, α-amylase inhibition, angiotensin I-converting enzyme inhibition, probiotic effects, antimicrobial and antitumor activity. In vivo studies have shown hypoglycemic, anti-inflammatory and hepatoprotective effects, regulation of lipid metabolism, regulation of anemia and repair of bone structure. Clinical studies confirm the hepatoprotective effect. Treatment with a mixture of honey, pollen and bee bread showed a significant lipid-lowering effect in patients with atherogenic dyslipidemia. Supplementation of bee bread during the recovery phase appears to provide improved athletic performance.

Conclusion: The structure of bee bread is complex and depends on the region. Studies have shown numerous benefits for human health, where bee bread has been used in prevention and therapy. It is necessary to conduct more research in this area.

Key words: bee bread, perga, health benefits

FOOD FOR GLUTEN INTOLERANT PEOPLE

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Food for people intolerant to gluten are products that are specially formulated, prepared and/or processed, with the aim of reducing the content of gluten, in one or more ingredients that contain gluten, or by replacing ingredients that contain gluten with other ingredients that are naturally gluten-free, intended to fulfill the specific dietary requirements people intolerant to gluten. Gluten intolerance includes celiac disease, gluten allergy and non-celiac gluten sensitivity.

The statement that can be stated with "gluten-free" type of food is allowed if the gluten content in the finished food is less than 20 mg/kg, and respectively , "very low gluten content" - which is allowed to state only if the food, consist of, or contains one or more ingredients originated from wheat, rye, barley, oats or their hybrid species, that had been specially processed with the aim of reducing the amount of gluten, and do not contain the gluten more than 100 mg/kg in the finished product.

From October to December of 2023 our Institution participated in the monitoring of food for people intolerant to gluten and the introduction of RIDA QUICK Gliadine dip stick immunochromatographic test for the qualitative detection of gluten, i.e. prolamin by extracting it from the sample with 60% ethanol. All tested samples (32 samples), marked as gluten-free food, had gluten content lower than 10 mg/kg.

Food prepared exclusively from gluten-free ingredients is suitable for the gluten-intolerant people diet, provided that it is not contaminated with gluten.

DISPERSION WITH SUPERCRITICAL EXTRACT OF THYME (*THYMUS VULGARIS* L.) AND LACCASE

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Objectives: *Thymus vulgaris* (thyme) is a significant aromatic plant widely used for medicinal purposes and as a culinary herb. It has antioxidant, antimicrobial, and anti-inflammatory properties. Liposomes are used in the topical delivery of cosmetic ingredients, lecithin is an emulsifier commonly used in pharmacy, and laccase is an enzyme belonging to the class of oxidoreductases. Carboxymethyl cellulose (CMC) is a mucoadhesive polymer. The main objective of this study was to estimate the antioxidant properties of liposomal dispersion with supercritical extract of thyme and laccase.

Materials and methods: Thyme extract produced by supercritical fluid extraction (SFE) with CO_2 was obtained at the Faculty of Technology and Metallurgy in Belgrade. Liposome gels were prepared by dissolving lecithin (1 wt%), SFE thyme extract (0.05% and 0.10%) and preservative Euxyl PE 9010 (0.10%) in water. Then, laccase (0.005%) and CMC previously dissolved in water (10%) were incorporated into liposome gels (1 or 2 depending on thyme extract percentage).

Results: High in antioxidants was a liposomal dispersion containing lecithin (1 wt%), CMC (10%), and SFE thyme extract (0.05%), without laccase addition (61.78 mg GAE/g of sample TP, FRAP = 0.21 mmol Fe^{2+}/100 g of sample, RSC = 27.44% of 100 mg/mL sample in DPPH assay and RSC = 7.60% of 10 mg/mL sample in ABTS assay). A positive but not significant correlation between parameters was obtained.

Conclusion: The proposed liposomal compositions demonstrated the potential use of the supercritical extract of thyme as an attractive cosmetic ingredient with antioxidant activity.

Keywords: thymus vulgaris, supercritical extracts, liposomal dispersion, antioxidant activity, total phenolic content.

THE ANTIOXIDANT AND ANTIINFLAMATORY PROPERTIES OF BLACK GOJI BERRY WATER EXTRACT

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Objectives: *Lycium ruthenicum* Murr, also known as black goji which fruits are traditionally used as a remedy to treat many diseases especially in Chinese and Tibetan medicine. The aim of the study was to quantify the antocyanin and sugar content as well as the antioxidant and anti-inflammatory properties of the water extract from the black goji berry *in vitro*.

Methods: The content of total anthocyanins and sugars in the water extract was determined spectrophotometrically. The antioxidant properties were investigated using the FRAP and β-carotene bleaching assays, while the anti-inflammatory properties were evaluated using the protein denaturation assay.

Results: The water extract of black goji berry contained 3.82 ± 0.17 mg cyanidin-3-O-glucoside chloride per g extract and 0.58 ± 0.04 mg glucose per ml extract. The water extract exhibited antioxidant activity showing $16.0 \pm 1.04\%$ inhibition in β-carotene bleaching assay and FRAP value of 1231.69 ± 33.22 as $Fe2+$ µmol/l. It also showed anti-inflammatory activity with $88.68 \pm 0.006\%$ inhibition of protein denaturation. There was a strong positive correlation between anthocyanins and FRAP value and sugar content and FRAP value, with Pearson correlation coefficients of 0.987 and 0.991, respectively ($p=0.05$).

Conclusion: Antioxidants play a crucial role in preventing oxidative cell damage and chronic inflammation. The demonstrated properties of the water extract suggest that they could be used as natural antioxidants and anti-inflammatory agents from plants that are effective for human use and have minimal side effects.

Key words: Lycium ruthenicum, anthocyanins, sugar, FRAP, protein denaturation

SESSION: ENVIRONMENT AND HEALTH

INVITED LECTURES

HEALTH TECHNOLOGY ASSESSMENT AS A VALUABLE FRAMEWORK FOR STEERING DECISION-MAKING IN PUBLIC HEALTH

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Health Technology Assessment (HTA) is a formal, systematic, and transparent process that accomplishes a multidimensional, multidisciplinary, and multistakeholder evaluation of the direct and indirect effects of a health technology and determines its value compared to existing alternatives. The evidence provided by HTA informs decision-making to promote quality improvement and sustainability in the health system [1,2].

The key common features of HTA and PH were identified [3] to be the interdisciplinarity of activities, the variety of methods to produce evidence, and the primary purpose of moving from research to practice. The increasing burden of chronic conditions, as well as populations ageing, and the relentless technological innovation whose implications are complex to assess, as in the case of artificial intelligence or genomic technologies, are burning trends generating the need to bridge HTA and PH [3].

In this environment of mounting pressure on health systems, decision-makers at all levels, generally encumbered by resource constraints, express demands for information on the effects of investing or disinvesting in technologies for health. Nevertheless, systematically addressing such demands requires an adequate human and organizational capacity for HTA [4]. In this light, PH policies and programs could benefit from the findings provided by HTA in countries where the bodies performing HTA activities are linked to the responsible governmental policy-making organs [4]. Institutionalized HTA processes indeed facilitate the generation and gathering of evidence to support informed decisions in all fields of health, including PH [5].

Policies, programs, and interventions aimed at prospectively reducing the burden of diseases, such as those based on community-based prevention, can be subject to HTA, whether we aim to prevent communicable diseases, such as HIV infections in at-risk populations [6], or non-communicable ones, for which physical activity interventions may be studied [7]. Examples of PH interventions undergone HTA involve physical activity promotion for diabetes and falls prevention, self-help groups and psychological interventions for fetal alcohol syndrome and child obesity, and community pharmacy interventions for smoking cessation [8]. The assessments take the form of *reports*, which can be classified according to their increasing comprehensiveness and scientific robustness in Rapid Reviews, Mini-HTAs, and HTA Reports [8]. Early HTAs should also be mentioned, used to inform industry and other stakeholders about the potential value of technologies in development, not yet applied (i.e., pre-marketing) [9]; Horizon Scanning, on the other hand, is used to identify, filtrate, and assess the future impact of new or emergent technologies and new applications of affirmed ones [10]. As Early HTAs are designed to evaluate health technologies even before they are brought into existence, they can support time-sensitive decisions, as in PH emergencies [11]. Taking the COVID-19 pandemic as an example, using HTA, the uncertainty attached to

interventions with significant financial and/or social implications such as mass vaccination campaigns [12] and masking mandates [13] could be quantified and considered as a factor in the assessment processes, allowing for multi-disciplinary considerations.

Appropriately executed HTAs [14] can help prioritize funding of interventions that demonstrate the highest value, and defund those with the lowest. Transparency, accountability, reproducibility, and systematicity are factors of HTA processes which legitimize decisions and potentially instill public trust, especially in instances where participatory approaches are adopted, and every stakeholder is involved in a process of consensus-building.

In Countries whose constitutions hold the safeguarding of health as a fundamental principle and embrace solidarity in benefit-sharing in their social welfare vision, HTA serves the purpose of PH not only by guiding community-based prevention strategies, but also curative (diagnostic and/or therapeutic), rehabilitative, and palliative interventions. These technologies are prioritized according to the perspective of providing value-based health care for all [15]. In fact, PH and healthcare, despite having formally distinct sets of roles and responsibilities, they share a common objective, namely addressing health threats [16].

To underline the relevance of all the components of healthcare for a sustainable publicly financed healthcare system, and the importance of empowering HTA within the organizational structures of States (institutionalization), the World Health Organization recently released an operational, step-by-step guide listing and explaining the requirements for a fruitful institutionalization of HTA mechanisms [17], to effectively connect the world of research to that of policy-making for applying evidence-informed decisions in healthcare.

This form of institutional mobilization for public health purposes is in line with the current supranational approach enacted in the European Union (EU). Infact, given the naturally disambiguous meaning of HTA for decision-makers, its self-evident necessity, and its overall utility, it was decided that that an infrastructural collaborative system for HTA activities was to be put in place at the EU level [18]. The current aim is to increase the efficiency of those HTA processes which generate knowledge with higher generalizability, namely that pertaining to the so-called clinical domains of effectiveness, safety, technical and epidemiological characteristics of technologies. As for the so-called non-clinical domains of HTA evidence, those of economic, ethical, organizational, societal, and legal aspects, it is up to the single States to produce assessments, the reason being that these aspects are context-dependent, thus far less generalizable than clinical aspects.

These insights allow to increase the magnitude of public health benefits driven by HTA, envisioning it as a tool not only for comprehensive technical evaluations of public health interventions, but also as a framework for the governance of all the healthcare choices in a publicly-funded healthcare system.

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GLOBAL CLIMATE CHANGE AND HEALTH – FUTURE CHALLENGES

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Climate change is affecting all parts of the Earth. It is predicted that climate change will affect human health in several ways. First, there will be direct consequences of extreme weather events (fires, droughts, flooding) leading to death and injuries; heat waves will be associated with stress, exhaustion, and heat stroke. In the long term, it leads to high mortality from cardiovascular, respiratory, and kidney diseases. The Eurostat data provide evidence of high general mortality rates across Europe related to heat waves in the summer, particularly in the Mediterranean countries. The second consequence of climate change is related to surface and underground water pollution from contaminated soil, industry, water treatment plants, landfills, and unprotected animal feeding operations. It is predicted that increased air and water temperatures may act favourably for the growth, survival, virulence, and propagation of water pathogens, which will be associated with the spread of water-borne diseases in populations where such diseases are rare. The pathogen burden in water sources, new pathogens, and/or resistant pathogens may present a problem for disinfection efficiency and a challenge for hygiene in the future.

Another challenge is related to the agricultural and animal breeding industry. For example, in Serbia, there are several new species of plant lice, midges, and insects (stink bugs), as well as new types of mites, weeds, and ragweed that appeared in our ecosystems in the last few decades, which are well-adapted to drought, high temperatures, and dry conditions in general with low rainfalls and no frost. In addition, as these pests have no natural enemies in the current environment, they thrive to the extent of compromising fruit, vegetables, crops, and organic food production, as well as endangering animal breeding. The industry must apply several adaptation measures to fight these pests, which may lead to the misuse or overuse of pesticides, thus making them enter the food chain and becoming a human hazard in the future. One of the constant problems related to unstable climate conditions is mold on maize and the subsequent presence of toxins in milk, which are harmful to humans. The estimated risk from intake of aflatoxin B1 is 1-2 cases of primary liver cancer yearly per 10 million. Finally, one of the greatest challenges in the future will be vector-borne diseases, such as malaria and dengue, as well as West Nile fever, and Lyme disease. These two are already present in Serbia, with the number of autochthonous cases rising due to the presence of pathogens and their vectors (mosquito, tick).

Health systems will be under pressure to respond to diseases, deaths due to extreme weather, heat, and radiation-related diseases, water-borne, food-borne, and vector-borne diseases, antibiotic resistance, as well as to treat undernutrition, dehydration, and malnutrition in the future. Despite the unstable climate conditions, health systems are expected to become climate resilient, i.e., capable of adapting to climate-related shocks and stress. This implies necessary changes in healthcare facilities' infrastructure, educating healthcare professionals about climate-related diseases, updating guidelines, conducting public health surveillance programs, and allocating budgets for climate-related issues. Health systems should do the most to reduce their vulnerability, prepare for climate-related disturbances, and continue providing healthcare services under new circumstances.

HEALTH IMPACT OF THE AIR POLLUTION BY PM TO POPULATION IN SKOPJE

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Introduction: 93% of children under 15 breathe toxic, polluted air. That is about 1.8 billion children younger than 15 and 630 million children younger than 5 which health and development are under serious risk. Air pollution is one of the greatest environmental risks to health, contributing to cardiovascular, respiratory diseases, and cancer. Despite the urgent need for decreasing air pollution levels worldwide, 99% of the world's population in 2019 lived in areas where WHO Air Quality Guidelines were not met.

Materials and methods: We reviewed the literature on Google Search, Google Scholar, and PubMed database by keywords "air pollution and human health effects," We included most recent facts from reviewed articles as appropriate for our research as well some outputs from North Macedonia in the field of air pollution and health.

Results: Incidence Rate of respiratory diseases in the Republic of Macedonia, Skopje and Veles during the period of 1990-2005 had decreasing trend which is in correlation with lowering trends of SO_2 and black smoke concentrations in Skopje and Veles. Highest trend of lowering of the incidence rate of respiratory diseases was registered in Skopje, second in Veles and in the Republic of Macedonia. From the registered data from Skopje's study it can be concluded that in the period of the investigation number of cardiovascular diseases and COPD was higher in the first season, compared to other three seasons in 2010 following the pattern of PM10 concentrations in the ambient air. There was registered significant statistical association between the average PM10 daily concentrations and cardiovascular diseases. Since the P-value in the ANOVA table is less than 0.05, there is a statistically significant relationship between PM2.5 and CVI at the 95.0% confidence level in Skopje in 2012. In 2012, long-term exposure to PM2.5 (49.2 $\mu g/m^3$) caused an estimated 1199 premature deaths (CI 95% 821–1519). The social cost of the predicted premature mortality in 2012 due to air pollution was estimated at between 570 and 1470 million euros. Moreover, PM2.5 was also estimated to be responsible for 547 hospital admissions (CI 95% 104–977) from cardiovascular diseases, and 937 admissions (CI95% 937–1869) for respiratory disease that year.

Conclusion: According to the investigations made in Skopje in the period 1990-2012 it could be concluded that there significant statistical association between the average PM10 daily concentrations and cardiovascular diseases. Estimates from the study performed in Skopje in 2012 indicate that long-term exposure to PM2.5 (49.2 $\mu g/m^3$) caused an estimated 1199 premature deaths. Reducing PM2.5 levels to the EU limit (25 $\mu g/m^3$) could have averted an estimated 45% of PM-attributable mortality, while achieving the WHO Air Quality Guidelines (10 $\mu g/m^3$) could have averted an estimated 77% of PM-attributable mortality.

Key words: Air pollution, public health impact, PM10, PM2.5

AMBIENT PARTICULATE MATTER ELEMENTAL COMPOSITION AND HEALTH RISK ASSESSMENT

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Urban air pollution, especially high levels of particulate matter, has emerged as a critical environmental concern in recent decades due to its harmful effects on human health, climate, visibility, and ecosystems. In 2019, the combined impact of outdoor and interior air pollution resulted in over 6.7 million deaths worldwide [World health statistics, WHO, 2023]. In 2021, air pollution levels in Europe surpassed the World Health Organization's (WHO) recommended thresholds, resulting in 327,000 fatalities in EU Member States (EU-27), with 253,000 of these deaths linked to exposure to fine particulate matter (PM2.5) [EEA Briefing no. 23/2023]. The 2020 assessment by the European Environment Agency identifies the Western Balkan region as one of the most polluted locations in Europe, with Skopje recognized as one of the most polluted capitals on the continent [Madjar et al., 2023].

During the 2015/16 IAEA Source Apportionment experiment, Skopje recorded the highest annual mean concentration of PM 2.5 at 58 µg/m3, above that of regional capitals such as Tirana (20 µg/m3), Belgrade (20 µg/m3), Sofia (34 µg/m3), and Banja Luka (30 µg/m3) [Almeida et al., 2020]. The countries of the Western Balkans have some of the highest mortality rates in Europe attributable to home and ambient air pollution [Almeida et al., 2020]. The age-standardized mortality rates due to household and ambient air pollution in 2016 for North Macedonia, Bosnia and Herzegovina, Montenegro, Albania, and Serbia were 82.2, 79.8, 78.6, 68, and 62.5 deaths per 100,000 inhabitants, respectively. The mortality rates in Macedonia, Montenegro, and Albania exceed the European Region average mortality rate (36.3) by more than double, and are over six times higher than the average mortality rate associated with household and ambient air pollution (12.86) in the five largest economies of the EU (Germany, France, Italy, Spain, and the Netherlands) [World Health Statistics, WHO, 2023].

Utilizing the Scopus database with diverse combinations of keywords, including ambient air, health risk assessment, heavy metals, and source apportionment, alongside specific countries or regions (Western Balkans, Serbia, Macedonia, Albania, and Bosnia), resulted in a restricted number of published studies, with only a handful of papers focusing on health risk assessments derived from the chemical composition of ambient particulate matter. The standard method for elemental analysis of ambient particulate matter involves wet chemistry techniques, including ICP-MS. Nevertheless, novel techniques employing energy dispersive X-ray fluorescence spectrometers are becoming increasingly favored, especially owing to the accessibility of multielement reference materials. Our laboratory has accredited this nondestructive technique for the analysis of 29 elements, including V, Cr, Ni, Cu, Zn, As, Ba, and Pb, directly on filters in a pure helium environment, in compliance with EPA method IO-3.3. The availability of reference materials and field calibration systems ensures adequate quality assurance throughout all stages of the process. Proficiency testing programs and interlaboratory comparisons enhance accuracy and foster customer trust, so ensuring the integrity and dependability of the generated data.

The International Agency for Research on Cancer (IARC) has classified ambient particulate matter as a human carcinogen (IARC, 2015). The metals and metalloids designated as carcinogenic in categories 1, 2A, and 2B are As, Cd, Cr (VI), Ni, V, and Pb, whereas the other elements, including Cu, Ba, and Zn, are categorized as non-carcinogenic (IARC, 2011).

The three principal exposure pathways for airborne metals are direct inhalation, ingestion, and cutaneous contact. The preliminary phase in assessing carcinogenic and non-carcinogenic risk involves quantifying the daily consumption of heavy metals.

The non-carcinogenic health risks linked to metals can be assessed using the hazard quotient (HQ), calculated by dividing the average daily dose (ADD) from each exposure pathway by the relevant reference dose (RfD) (mg/kg per day) for the same exposure route (Hao et al., 2020; Dahmardeh Behrooz et al., 2021). The Hazard Index (HI) was calculated as the sum of Hazard Quotients (HQ) to assess the cumulative potential for non-carcinogenic risks arising from multi-element exposure along a singular exposure pathway (Dahmardeh Behrooz et al., 2021; Miletic et al., 2024).

No exposure pathways appear for any of the metals that pose unacceptable carcinogenic risks. Inhalation accounts for approximately 62% of the overall cancer risk. Chromium is a principal carcinogenic metal. Each exposure pathway accounts for approximately 30% of the overall cancer risk. Chromium by inhalation and nickel through food and cutaneous exposure are the principal carcinogenic metals.

DOES SEX MATTER?
A GROWING ROLE OF SEX DIFFERENCES IN AIR POLLUTION EPIDEMIOLOGY

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Sex- and gender-oriented medicine is an emerging field that recognizes critical differences in disease manifestation in and treatment of men and women. Historically, medical research and clinical trials predominantly focused on male subjects, often overlooking the unique physiological and hormonal differences between the sexes. "Sex" refers to biological differences between males and females, such as chromosomes, hormone levels, and reproductive organs. "Gender," on the other hand, pertains to the roles, behaviours, and identities that societies attribute to individuals based on their perceived or actual sex. The importance of this distinction lays in highlighting that both biological and social factors influence health outcomes in both men and women.

For instance, cardiovascular diseases, autoimmune disorders, cognitive disorders, and Alzheimer's disease (AD) can present distinct symptoms and outcomes based on sex and gender. Women are more likely to develop AD than men[1], and the disease often progresses differently between the sexes[2]. Understanding these differences is crucial for developing tailored medical treatments that improve patient outcomes. Moreover, the interaction between biological sex and gender identity can influence health behaviours and access to healthcare. In Germany, the Charité University Hospital in Berlin established a dedicated clinic for sex and gender medicine in 2007, reflecting the growing recognition of this field[3]. In spite of such advancements, sex and gender-oriented medicine is still in its infancy. By integrating sex and gender perspectives into medical research and practice, healthcare professionals can provide more personalized and effective care. This approach not only enhances the quality of treatment but also promotes health equity by addressing the specific needs of diverse patient populations. Therefore, advancing sex and gender-oriented medicine is essential for a more inclusive and precise healthcare system.

With air pollution the science on sex and gender differences has just been started to be investigated thoroughly[4]. Studies have shown that exposure to pollutants such as particulate matter (PM), nitrogen dioxide (NO_2), and ozone (O_3) can have varying health impacts on men and women. The results indicate that women are generally at a higher risk of developing respiratory conditions, like asthma, and cardiovascular diseases due to air pollution[5]. New epidemiological studies suggest that cognitive disorders[6], such as Alzheimer's disease, and obesity[7] in addition to being connected to air pollution, have a sex-specific dependence. Understanding these sex-specific susceptibilies for air pollution are helpfull for developing effective as well as differentiated public health policies and interventions. Tailored strategies and studies underline the importance of integrating sex and gender perspectives in environmental health research and policy-making.

Although individual differences have been studied for a long time, the differences in sex and gender – despite being obvious – having long time been underestimated. Incorporating sex and gender considerations into the study of air pollution and health can lead to more accurate

risk assessments and more equitable healthcare solutions. As research in this area continues to evolve, addressing these differences will be crucial to protect and improve public health outcomes for both men and women.

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ORAL PRESENTATIONS

INSTAGRAM FILTER USE AMONG FEMALE AND MALE STUDENTS: ARE THERE DIFFERENCES IN ASSOCIATIONS WITH AFFECTIVE TEMPERAMENTS?

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Objectives: Studies indicate different use of Instagram filters between males and females. However, the nature of this difference has not yet been fully understood. The aim of this study was to examine the relationship between different types of affective temperaments and the use of Instagram filters among males and females, with hypothesis of different profiles in terms of these associations.

Materials and methods: The study sample included 192 (65.1% female) students, who filled in the questionnaire about Instagram use and Temperament Evaluation Of Memphis, Pisa, Paris and San Diego auto questionnaire (TEMPS–A) (which examined cyclothymic, depressive, irritable, hyperthymic, and anxious temperament).

Results: The study showed that 15.3% of students did not use filters at all; 4.7% of students used filters often. Female students used filters significantly more often than males. Among females, filters use was significantly associated with all temperaments except hyperthymic. Among males, the use of filters was not associated to any of the affective temperaments.

Conclusion: The findings speak in favor of the differential association of Instagram filters use and affective temperaments between female and male students. The implications of these findings are discussed.

Key words: Instagram; Instagram filters; TEMPS - A

THE IMPORTANCE OF THE ROLE OF THE INSTITUTE FOR PUBLIC HEALTH NIS IN HEALTH RISK ASSESSMENT - OVERVIEW OF ACTIVITIES FROM 2014 TO 2024

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Objectives: PHI Niš is an authorized preventive health institution which actively participates in disaster risk reduction and emergency management on the territory of 11 LGUs of Nišava and Toplica administrative districts. The aim of this paper is to present activities in health risk assesment Center for hygiene and human ecology of the PHI Niš from 2014. to 2024. in emergency situations, regardless of its cause but especially for safe water suplly during floods.

Materials and methods: According operating procedures and methodological instructions,it is necessary to implement interventions in order to reduce risks to the health of the population like: assessment of the situation and organization of service (safe drinking water and food, collective accommodation and ddd measures).

Results: The publication of the Standing Conference of Cities and Municipalities (SKGO) gave a ten-year cross-section of the situation since the May floods in 2014, not taking into account the floods in the South Morava basin that happened in April. During April 2014 (7) and June 2023 (6) many municipalities from Nišava and Toplica districts declared a state of emergency because of floods. Comparing 2014 to 2023, the number of drinking water samples is lower due to better risk assessment and flood response mapping. After the floods of 2014 and 2023, according methodology WHO and with the coordination of the Ministry of Health of Serbia, PHI Niš held the education "The response of the local community to emergency/crisis situations" (2015) and applied the STAR-Strategic Tool for Risk Analysis (2024) for assessment of public health risks.

Conclusion: Priority local action for floods is to involvement of representatives from IZJZ Niš in the LGU Health Council as well as in the LGU Emergency Situations Headquarters. On national level, Team for emergency situations from IPH Serbia, should keep a register of emergency events, report emergency events with practical solutions and develop good practice protocols for different hazards.

Key words: IPH Niš, health risk assesment, safe drinkig water, floods, emergency situations

THE STATE OF AIR POLLUTION AND POSSIBLE HEALTH RISKS

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Air pollution represents an unwanted state of the natural environment where the air is polluted with substances that are harmful to human health. Skopje, as well as most of the cities in RSM, constantly face this problem. It is a health hazard and leads to the deterioration of the health condition of a large part of the population.

Results: The monthly reports of the State Automatic Air Quality Monitoring System for Skopje show that in 2023 there were more than a hundred days with polluted air, that is, exceeding the permissible limit value of PM10 particles of 50 mg/m3. According to world health standards, there should not be more than 35 days with polluted air in a calendar year.

All data indicate how dangerous living in conditions of toxic smog is to health. 30 to 35 percent of diseases are caused by air pollution. The data show that the death rate is highest in the winter period, when the concentrations of harmful substances in the air are actually the highest. In previous years, an average of about 1,300 lives were lost annually due to air pollution.

Conclusion: This imposes the need to adopt appropriate measures to protect the health of the population. Adequate recommendations are constantly given that citizens should respect in conditions of concentrations of air polluting particles above the permitted ones. However, long-term processes that will help overcome this problem should be worked on.

Key words: air, health, measures

MODELING OF POLLUTION DISTRIBUTION AS A TOOL FOR PROVING HISTORICAL POLLUTION

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Objectives: To determine the capacities of applying mathematical models for the analysis of air movement as a tool for the analysis of the distribution of historical pollution.

Materials and methods: The paper used data on the content of certain pollutants at the source of pollution and data on the amount of pollution at the place of determination. Data on pollution were obtained from competent state institutions and from scientific publications, and data on weather conditions from a network of meteorological stations. Data processing and pollution distribution modeling were done by computer programs with authorized and patented software solutions.

Results: Based on data on pollution sources in Serbia and data on determinated pollution in Greece, using meteorological data and mathematical modeling of the distribution of historical pollution caused as a result of NATO's actions during the aggression against the Federal Republic of Yugoslavia (Serbia), we proved the connection of pollution sources in Serbia with place of determination of pollution in Greece. We also determined the spatial and temporal distribution of pollution.

Conclusion: If we know the appropriate data about the source of pollution, using adequate mathematical models and software solutions, it is possible to determine the spatial and temporal distribution of pollution that occurred even decades earlier.

Key words: NATO aggression, air pollution, weather condition, mathematical modeling.

POSTER PRESENTATIONS

MODERN AND HISTORICAL POLLUTION FROM THE MINING INDUSTRY AS AN ENVIRONMENTAL AND HEALTH RISK IN THE IBAR RIVER BASIN

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Objectives: Determination the impact of pollution caused in the process of mining and processing of lead and zinc ore in the area of the Ibar river basin on the occurrence of risks to the environment and the health of the population in this area.

Materials and methods: Data on the characteristics of the production process and industrial landfills have been collected by visiting the field, local inspection of the industrial areas, from the documentation of RMHK Trepča and from a review of the literature. Data on the distribution of pollution were obtained by sampling of the biogenic and abiogenic material in the Ibar river basin. The samples were analyzed with the ICP-OS method.

Results: The beginnings of mining in this area date back to 2000 BC. The industryal mining and processing of lead-zinc ore in the facilities of the Trepča plant has lasted for more than 100 years. Mining and processing of ore into concentrate continues today. In the area from Kosovska Mitrovica to Kraljevo, today we have 8 industrial landfills with about 50 million tons of industrial waste, which continuously pollutes the Ibar River. In several accidental situations (release of tailings and dam bursting of landfills), these pollutions were even more expressive.

Conclusion: The consequences of pollution are reflected in the finding of increased concentrations of both ore metals (lead and zinc) and accompanying pollution created during ore processing, both in biogenic and abiogenic environmental factors. Ecological and health risks are greater in the alluvium of the Ibar River than in the elevated areas of the basin where water from the river does not reach.

Key words: mining industry, environmental and health risks.

SYSTEMATIC APPROACH TO CONTROLLING CORROSION AND BIOFILM IN A HOSPITAL'S INTERNAL WATER SUPPLY SYSTEM: A CASE STUDY

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Objectives: The goal of this case study was to systematically assess and reduce the risks in the internal water system of Hospital X arising from corrosion and biofilm. Pipe corrosion caused mechanical damage like pits, leading to leaks and deterioration of microbiological water quality.

Materials and Methods: The approach included a comprehensive on-site inspection to identify leaks and corrosion, followed by the remediation of damaged parts, cleaning, degreasing, and controlled systematic professional disinfection of the water system. Regular monitoring and maintenance protocols were established.

Results: Microbiological testing obtained after the initial measures and after 6 months of regular maintenance demonstrated that a combination of cleaning, degreasing, and controlled disinfection of internal water system are crucial in preventing further corrosion and biofilm formation. These measures, alongside other preventive measures contribute to water safety in the hospital.

Conclusion: Effective management of water systems in hospitals requires a comprehensive approach, including regular effective cleaning, degreasing, and controlled disinfection. It is important that these practices are implemented in combination with other preventive measures to prevent biofilm formation on pipes. Adequate training and education of staff by water safety experts are also crucial to ensure legal and proper execution of all preventive and additional measures.

Key words: biofilm, corrosion, hospital, cleaning, degreasing, internal water system

DRINKING WATER MONITORING IN 2023

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The aim of the paper is to present the results of the analysis of drinking water samples in original packaging (natural mineral and spring water) from the Food Safety Monitoring Program for 2023, under the jurisdiction of the Ministry of Health.

Materials and methods: The monitoring program is carried out by the ministry responsible for health affairs through the Institute and Institute of Public Health in cooperation with the sanitary inspection. Laboratory tests are carried out by authorized laboratories of the Institute and Institute for Public Health. The monitoring plan determines the type of analysis, the type of food (water) to be analyzed and the number of samples to be used during the analysis. This plan envisages the control of 250 samples of natural mineral water and 160 samples of natural spring water, for inappropriate physical and chemical properties, deviations from the maximum allowed concentrations of contaminants. Analyzes were performed in the sanitary chemistry laboratory of the Center for Hygiene and Human Ecology.

Results: According to the monitoring instructions, 10 samples of natural mineral water and 10 samples of natural spring water were analyzed. The number of samples analyzed in our laboratory is 4.9% of the total number included in the monitoring. All the mentioned samples had the analyzed parameters within the permitted limits of deviation from the maximum permitted contaminant concentrations and corresponding physical and chemical properties.

Conclusion: The collection of monitoring data will be used for risk analysis, for certain types of food, and thus contribute to increasing the protection of human health and other consumer interests.

Key words: food, water, monitoring program

TEN-YEAR ASSESSMENT OF DRINKING WATER QUALITY FROM PUBLIC FOUNTAINS IN TUZLA CANTON

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Objectives: Public drinking fountains have been decorative, unusual symbols of populated areas for centuries. This study aims to evaluate the water quality of public fountains as a type of local water source outside the monitoring system, representing a significant ecological risk factor.

Materials and methods: The study was conducted from 2013 to 2023 in 13 cities of Tuzla Canton, Tuzla, Bosnia and Herzegovina. A total of 312 samples were collected from 31 locations, with sampling occurring once per year. Physicochemical and microbiological analyses of water quality were performed according to accredited methods.

Results: Bacteriological contamination was the highest in 2013, with 20 (83.8%) samples being contaminated, and lowest in 2022, with 7 (22.5%) samples. Physico-chemical contamination was the highest in 2021 with 4 (13.33%) samples and lowest in 2022 with 4 (12.9%) samples. Microbiological contamination in 2013 was mainly due to Enterococcus spp. in 14 (58.33%) samples and E. coli in 9 (37.5%) samples.

Conclusion: Fecal contamination in public drinking fountains indicates poor maintenance. Establishing continuous monitoring of sanitary and hygienic conditions is a priority to protect public health and ensure the safety of water from these sources.

Key words: water quality, public fountains, bacteriological contamination, fecal contamination, public health

THE BATHING WATER QUALITY ASSESSMENT OF THE BELOCRKVANSKA LAKES

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The Institute of Public Health Pančevo

Objectives: The aim of the paper was to assess the quality of bathing water and the microbial risk for Belocrkvanska Lakes.

Materials and methods: The bathing water quality was assess based on the ecological status of surface waters, Serbian water quality index (according to the national regulations) and microbiological risk (according to the WHO recommendations). The period 2019-2023 was observed.

Results: The results show that according to the ecological status, recommendation for swimming was given in 13 (44,8%) samples of Glavno Lake and in 14 (48,3%) of Vračevgajsko Lake. The parameters BPK5, HPK, total nitrogen and dissolved oxygen show the most frequent deviations from the third class of ecological status. SWQI was good or very good in 19 (65,5%) samples of Glavno Lake and in 23 (79,3%) of Vracevgajsko Lake. Microbial risk was low in 28 (96,6%) samples of Glavno Lake and in 26 (89,6%) of Vracevgajsko Lake.

Conclusion: Belocrkvanska Lakes show excellent microbiological bathing water quality. Deviations are present in parameters of oxygen regime and in several samples in nutrients. It is necessary to strengthen measures to control urban water pollution and to improve the management of lake water quality.

Key words: bathing water, SWQI, microbiological risk

ASSESSMENT OF COMMUNITY NOISE EXPOSURE FOR THE LOCAL POPULATION IN THE CITY OF ŠABAC, SERBIA

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Objective: This study aimed to assess the exposure of the local population to noise in the medium-sized city of Šabac, Serbia, over the period from 2016 to 2021.

Method: A retrospective analysis was performed on the noise measurement data collected by the Public Health Institute of Šabac from 2016 to 2021. The methodology included the following procedures: I) Characterization of the study area, II) Data collection and validation, III) Calculation of exposure indicators, and IV) Application of a linear trend model to present yearly changes in noise levels over the observed period.

Results: Noise measurements were conducted at 20 locations distributed across different zones of the city. The findings indicate that the population in all zones (except Zone V) of Šabac are exposed to high noise levels both during the day (average: Zone I 62.1±1.8 dB; Zone II 59.2±2.3 dB; Zone IV 62.8±4.7 dB; Zone V 58.0±0.9 dB; Zone VI 66.8±0.7 dB) and at night (average: Zone I 56.5±2.0 dB; Zone II 53.9±3.2 dB; Zone IV 57.4±3.7 dB; Zone V 55.1±0.8 dB; Zone VI 59.4±1.1 dB). During the analyzed period, the average yearly equivalent noise levels increased by 0.67 dB (1.1%; $R^2 = 0.6$) during the day and by 0.64 dB (1.1%; $R^2 = 0.52$) at night. If this trend continues, the projected day-time noise level in 2030 could reach 70.7 dB and night-time noise level could reach 64.5 dB.

Conclusion: The study suggests a continuous increase in noise levels in Šabac, which may lead to significant exposure risks for the local population if current trends persist. Effective noise management strategies are essential to mitigate future increases and protect public health.

Keywords: noise pollution, public health, retrospective study, noise trends

DOES GREEN INFRASTRUCTURE AFFECT HEALTH?

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Objectives: The aim of this work is to present the current knowledge related to effect of green infrastructure on health.

Methods: The available literature as well as the latest research on green infrastructure as a factor of the community and the entire society was used as a working method. Data from the available domestic and foreign literature related to the objective of the paper on the given topic were analyzed. The published material and researches were selected for inclusion in the work from the point of view of importance, availability, appropriateness as well as the point of view of future possibility of use.

Results: Analyzing the studies, it is unclear what is considered green space and green infrastructure, which limits the interpretation of the study. In addition to positive effects, increase of the green infrastructure in urban environments may also potentiate the role of rats and ticks in the spread of infectious diseases, may provide habitats for mosquitoes and toxic algal blooms and may also adversely affect citizens who are allergic to pollen.

Conclusion: Green space has many health benefits, but the health effects of green infrastructure are still largely unknown owing to a lack of studies. Further studies are urgently needed.

Key words: Green infrastructure, health benefits, health hazards

THE IMPACT OF ENVIRONMENT ON HEALTHY LIFESTYLES

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Abstract: The environment plays a crucial role in shaping and maintaining healthy lifestyles, a topic of increasing importance in psychological research. This review delves into the multifaceted relationship between environmental factors and the adoption of healthy behaviors, examining how various aspects of the physical, social, and cultural environments influence psychological well-being and lifestyle choices.

Physical environments, including urban design, green spaces, and accessibility to recreational facilities, significantly impact individuals' ability to engage in physical activity and maintain a balanced diet. Studies show that people living in neighborhoods with abundant green spaces are more likely to participate in regular physical activities, which contributes to better mental and physical health. Conversely, environments characterized by high levels of pollution, noise, and limited access to healthy foods—known as "food deserts"—are associated with increased rates of obesity, sedentary behavior, and mental health disorders.

Social environments, encompassing family, community, and peer influences, also play a pivotal role in the development and reinforcement of healthy lifestyles. Social support systems, such as those provided by family and friends, can encourage or discourage healthy behaviors like regular exercise and balanced nutrition. Research has demonstrated that strong social support is linked to better adherence to healthy lifestyle choices, while social isolation or negative peer pressure can lead to unhealthy habits, including poor diet and substance abuse.

Cultural environments, shaped by societal norms, values, and media influence, further contribute to lifestyle behaviors. Cultural attitudes towards food, body image, and health can either promote or hinder the adoption of healthy lifestyles. For example, cultures that value slimness and fitness often encourage dietary restraint and regular physical activity, while those that normalize unhealthy eating patterns may contribute to rising obesity rates.

The review also explores the intersectionality of these environmental factors, highlighting how they interact to influence health behaviors. For instance, individuals in low socio-economic environments may face compounded challenges, such as limited access to recreational spaces, poor social support, and cultural barriers, making it more difficult to adopt and maintain healthy lifestyles.

In conclusion, this review underscores the importance of adopting a holistic, environmental approach to promoting healthy lifestyles. Interventions aimed at improving physical environments, enhancing social support systems, and addressing cultural barriers are crucial in fostering sustainable healthy behaviors. Future research should focus on longitudinal studies to better understand the long-term impact of environmental changes on lifestyle behaviors and mental health outcomes, as well as the development of multi-level interventions that address the complex interplay of environmental factors in promoting health.

Key words: environment, healthy lifestyle, physical activity, social support, cultural influences.

LIGHT POLLUTION AS THE HEALTH AND HYGIENIC PROBLEM

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Since the prehistoric era, human civilization has used a variety of light sources. Nowadays light pollution, as the presence of any unwanted, inappropriate, or excessive artificial lighting, disrupts the natural patterns of wildlife, contributes to the increase in carbon dioxide in the atmosphere, affects on human health, and obscures the stars in the night sky.

Objectives: Objective of this work is to highlight the light pollution as the health and hygienic problem

Materials and methods: A review of the literature was conducted using PubMed and based on the latest paper 2015 to 2024 about the health outcomes of light pollution

Results: Sleep disorder is still the main negative effect of light pollution, but also novel associations between light pollution and some common health concerns have been suggested, such as obesity, cancers, neurodegenerative diseases, retinal dysfunction and mental disorders. Although there are regulations and standards concerning light pollution, few of them are based on the potential contribution of improper lighting to diseases. Exposure to light, especially at night results in a disruption of the circadian system which is deleterious to health and the potential mechanisms of the deffects on health are suppression of melatonin and sleep deprivation. There are also the toxicological mechanism of light pollution via circadian disruption, since light pollution directly interferes with the natural light-dark cycles, and damages the circadian photoentrainment of organisms.

Conclusion: The light pollution exposure usually results sleep problems, from late sleep in the nighttime and the late awake in the daytime and point the need for further assessment and control strategies. It is important to consider adjusting confounding factors, and verified the various characteristics of artificial light significance of light wavelength, intensity, and timing. Ongoing efforts is needed to ensure low levels of light pollution, specially in urban environments.

Key words: light pollution, health, sleep disorder, prevention

USE OF CHLORINE DISINFECTANTS IN HOSPITAL HYGIENE

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Objectives: The aim of this paper is to review current infection control recommendations for the use of chlorine disinfectants, and explore the advantages and disadvantages of using chlorine-based disinfectants in hospital hygiene practices. The focus is on understanding their efficacy in infection control measures, potential health risks, and environmental impact.

Materials and methods: A comprehensive review of current literature and serbian and international infection control guidelines was conducted, examining studies on the effectiveness of chlorine disinfectants in eliminating pathogens, their safety profile, and the long-term environmental effects. The legal regulations in Serbia were also considered.

Results: Chlorine disinfectants are commonly recommended in current infection control guidelines due to their broad-spectrum antimicrobial activity, which includes bacteria, viruses, and fungi. Chlorine disinfectants were found to be highly effective in reducing bacterial and viral contamination in hospital settings, significantly lowering the incidence of healthcare-associated infections. However, their use poses risks, including respiratory irritation for patients and healthcare workers and potential toxicity from by-products. Environmental concerns were also noted, particularly related to the disposal of chlorinated compounds and their impact on aquatic ecosystems.

Conclusion: While chlorine-based disinfectants are a powerful tool in hospital hygiene, their use requires careful management to balance efficacy with safety and environmental considerations. Further research into safer alternatives and best practices for chlorine use is recommended.

Keywords: Chlorine disinfectants, hospital hygiene, infection control, environmental impact.

PRESERVATIVES IN COSMETICS SAMPLES FROM THE MINISTRY OF HEALTH'S MONITORING PROGRAM, 2023

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Objectives: The aim of the work is to present the results of the analysis of cosmetics samples from the Ministry of health's monitoring program, 2023.

Materials and methods: The monitoring plan determines the type of analysis, the type of items of general use that will be analyzed and the number of samples that will be used during the analysis. This plan foresees the control of 768 samples of cosmetics, for the content of preservatives, of which 97 were analyzed in the Sanitary chemistry laboratory of the Center for Hygiene and Human Ecology. The determination of the preservative was performed employing a HPLC system equipped with UV diode array detection. All samples were analyzed for the content of methyl-, ethyl, propyl-, butyl-paraben, phenoxyethanol, Na-benzoate, K-sorbate, methylisothiazolinone and methylchloroisothiazolinone.

Results: The number of samples analyzed in our laboratory is 12,6% of the total number included in the monitoring. Out of 97 samples, the content of preservatives in 94 samples was within the allowed limits, while 3 samples had an increased content of one of all preservatives, which is 3,1% non-compliant.

Conclusion: Data collection from monitoring will be used for risk analysis, for certain types of items of general use, and in this way will contribute to increasing the protection of human health and other consumer interests.

Key words: cosmetics, preservatives, monitoring programe, parabens, thyazolinones

SESSION: **THEORETICAL AND PRACTICAL PROBLEMS OF NON-COMMUNICABLE DISEASES**

INVITED LECTURES:

1. PUBLIC HEALTH AND HEALTH INEQUALITIES–IDENTIFYING AND ADDRESSING THE GAP

Professor dr Eleni Jelastopulu

University of Patras, Greece

2. FACTORS ASSOCIATED WITH THE QUALITY OF LIFE OF SUBSTANCE USERS AND THEIR CAREGIVERS

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Addictive diseases are medical disorders from the field of psychiatry, which carry with them a complex causality of occurrence, numerous manifestations of the disease, a different clinical course and outcome. It is common and can have serious physical and psychological consequences, including chronic diseases, social dysfunction, and mental health disorders. As with most other diseases, we attribute the disease to an individual, and thereby neglect the important aspect that can affect the environment around the patient, primarily thinking of his immediate environment. Addictive diseases are a major public health problem. Disorders caused by alcohol and opiate addiction lead to physical, mental and socioeconomic deterioration not only of the patient, but also of their families, i.e. guardians.

Family caregivers are persons who provide unpaid care to other family members who need supervision or help in case of illness or disability, as well as to persons with special needs. The disease negatively affects the individual in the form of physical, emotional, financial and social dysfunction. All of the above leads to problems, difficulties or unwanted events that affect not only the patient but also his environment. Studies have shown that the illness of one family member affects the quality of life of other family members, especially the caregiver of the patient. The burden of family members comes from the activities and actions performed as a caregiver and the changes that occur in their social and professional life. Also, the burden is aggravated by various situations that are encountered in care as lack of information about the disease and its treatment, strategies for dealing with inappropriate behaviors and crises. These events can overload the family caregiver and consequently their health, well-being, and the quality of life. On the other hand, previous studies indicate that the support of family members is of great importance and influence on the initiation of addiction treatment, compliance and participation in it, but also on the outcome itself, i.e. the success of the treatment of patients with supstance use disorders.

Assessment of the quality of life of persons addicted to psychoactive substances, as well as their caregivers, is an important aspect of the therapeutic protocol for this population. Taking into account the worse quality of life in caregivers, more pronounced depressive symptomatology in patients, quality of sleep and socioeconomic predictors, it is important to adequately approach both the patient and the caregiver in order to provide the necessary help and more successful treatment. In addition to a low the quality of life, people with substance use disorders often face stigma in different forms (experienced stigma, perceived stigma, self-stigma). Stigma may have negative consequences, such as health issues, and lower the the quality of life. The quality of life and stigma seem to be two important social and health factors for people with substance use disorders.

Interventions that help thise patients get support from people within their social networks who support their recovery are also essential to their quality of life. Therefore, there is still an emerging need to organize and implement nursing care, attention of health professionals, and efficient public policies towards people with substance use disorders and their caregivers.

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3. PREMATURE CARDIOVASCULAR MORTALITY IN THE REPUBLIC OF SERBIA AND WORLDWIDE

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Cardiovascular disease (CVD) is the leading cause of death worldwide, responsible for an estimated 17.9 million deaths in 2019, accounting for about one-third of all deaths globally (1). In the same year, out of the 17 million deaths under the age of 70 due to noncommunicable diseases, 38% were caused by CVDs (1). CVD is more and more diagnosed at younger ages, despite considerable improvement in disease progression and prevention strategies (2). In this group of diseases, ischemic heart disease (IHD) and cerebrovascular disease remain the major causes of premature mortality (3). The burden of premature cardiovascular mortality is disproportionately high in low- and middle-income countries compared to high-income countries (4). This is very important, taking into account that the Republic of Serbia is an upper-middle-income country. Premature mortality refers to deaths that occur at a younger age than expected (4). The World Health Organization (WHO) considers premature mortality as the probability of dying between the ages of 30 and 70 years, while some studies define it as the age below 65 or 75 (5). In 2015, the WHO developed an ambitious target to reduce premature mortality from non-communicable diseases through the Sustainable Development Goal by one-third until the year 2030 (4). By 2025, about 5 million premature CVD deaths among men and 2.8 million among women are projected globally, which can be reduced to 3.5 million and 2.2 million, respectively, if risk factor targets for blood pressure, tobacco use, diabetes mellitus, and obesity are achieved (6). It is expected that the risk of a premature CVD death in 2025 will be highest for men in Central Asia and Eastern Europe and for women in Oceania, while the lowest risk will be present in Western Europe, high-income Asia Pacific, and Australasia (7).

There are several methods to calculate the burden of premature mortality, including a year of potential life lost (YPLL), age-standardized mortality rate (ASMR), and standard mortality ratio (SMR) (8). The study, which estimated global ASMR for premature cardiovascular mortality, revealed a higher ASMR for ischemic heart disease compared to stroke, sex-specific differences with higher ASMRs for males, and country-specific differences with significantly higher ASMR in middle-income countries (4). The overall CVD YPLL rate and standard expected years of life lost SEYLL rate were low in high-income countries (Switzerland, Belgium, Spain, Slovenia, the USA, and South Korea) and were high in middle-income countries (Brazil, India, South Africa, and Serbia) (2). During the period from 1990 to 2022, it has been observed a slight increase in the YPLL rate and the SEYLL rate for overall CVD and ischemic heart disease but a slight decrease in the SEYLL rate for cerebrovascular disease (3). The SEYLL rate for overall CVD significantly increased in the Western Pacific region, declined in the European region, and reached a plateau in the American region (3). In the USA, although the premature cardiovascular mortality rate among adults aged 25–64 has decreased by 70% since 1968, it remained stagnant from 2011 on and, in 2017, still accounted for almost 1-in-5 of all deaths among this age group (9).

Our study investigated premature cardiovascular mortality in the population of Serbia and Belgrade for the period from 2000 to 2022 (10). During that period, 343,089 premature deaths occurred among men and 181,376 among women. Premature cardiovascular deaths in men predominantly were a result of ischemic heart disease, while for women the main contributor was cerebrovascular disease. Premature deaths caused by all CVD, IHD, and cerebrovascular disease showed declining trends during the observed period, while hypertensive heart disease showed an increasing trend (10).

Although most CVD deaths are preventable with currently available interventions, it still kills more people than any other cause (11). Continued high rates of hypertension and increasing prevalence of diabetes and obesity represent obstacles for establishing a downward trend for premature cardiovascular mortality (9).

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4. ANXIETY AND DEPRESSION IN WOMEN DURING CERVICAL CANCER SCREENING: A LITERATURE REVIEW

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Abstract

Globally, cervical cancer ranks as the fourth most common cancer in women, both in terms of incidence and mortality, with around 660,000 new cases and 350,000 deaths recorded in 2022. Still, it is one of the most preventable cancers and one of the most successfully treatable and curable cancers when detected early and treated adequately. Hence, cervical cancer screening is the cornerstone of averting morbidity and mortality from cervical cancer, together with vaccination against *Human papillomavirus* (HPV) and treatment of identified pre-cancerous lesions. In addition to the United Nation's Sustainable Development Goals that involve reducing premature mortality from non-communicable diseases by one third by 2030, the World Health Organization has set out the targets to be achieved by 2030 in order to eliminate cervical cancer as a public health problem, and this target involves fully vaccinating by the age of 15 90% of girls with HPV vaccine, having 70% of women undergo screening at least twice (by the age of 35 and by the age of 45) and treating 90% of women with pre-cancer and managing 90% of women with invasive cancer. However, current trends do not indicate that these goals will be achieved worldwide. Thus, prevention measures need to be strengthened. Research has identified anxiety and depression, among other variables, as key barriers to screening, which span out to the entire screening process – invitation, exam/test, receipt of results, follow-up diagnostics. However, a particular concept involves the occurrence of these psychological states as potential harms of the cervical cancer screening program itself, which can reduce participation in screening, lower adherence to follow-up and cause long-term consequences. Precise identification and measurement of these psychosocial harms can provide targets for improving the effectiveness of cervical cancer screening program.

Key words: cervical cancer screening; anxiety; depression.

Introduction

According to the GLOBOCAN estimates, cervical cancer ranked as the fourth most common cancer in women in 2022 with about 660,000 new cases and 350,000 deaths worldwide [1]. The incidence and mortality rates showed great variations around the world. The highest age-standardized rates of incidence were noted in Eastern Africa (40.4 per 100,000) and Southern Africa (34.9 per 100,000) and the lowest in West Asia (4.1 per 100,000) and Australia-New Zealand (5.2 per 100,000). The highest age-standardized mortality rates were recorded in Eastern Africa (28.9 per 100,000) and the lowest in Australia-New Zealand (1.4 per 100,000) and equally about 2.2 per 100,000 in Northern America, Northern Europe, Western Europe, Southern Europe and Western Asia. Most of the countries in the world have been experiencing a decrease in incidence rates of cervical cancer, apart from countries in the Baltics, East and South Africa, and Japan and China [1].

Recognizing the magnitude of the public health issue that cervical cancer represents, the World Health Organization issued a global call for cervical cancer elimination [2] and created the Cervical Cancer Elimination Modelling Consortium to inform these efforts [3]. The WHO's initiative for cervical cancer elimination calls for reducing the incidence rates below 4 per 100,000 women-years [1].

Mathematical modelling studies found that if the current trends continued, over 44 million cases of cervical cancer are to be expected up to 2069 [4]. However, if all low middle income countries managed to implement *Human papillomavirus* (HPV)-based screening two times during a woman's lifetime and with a 70% global coverage, nearly a third of projected cervical cancer cases could be averted. Understanding reasons for non-participation in cervical cancer screening programme, as well as for non-adherence to follow-up procedures, is essential for achieving the full potential for prevention.

In a world that is still recovering from cancer screening disruptions caused due to the COVID-19 pandemic, it is especially important to understand factors that determine and hinder participation in a screening programme [5].

The participation rates for cervical cancer screening show significant geographical variation. According to the latest report of the European Commission, the highest rates of cervical cancer screening were observed in Sweden and Norway, while the lowest participation rates were noted in Serbia and Romania [6]. The most comprehensive to-date evaluation of the cancer screening programmes around the world, the CanScreen5 global project of the International Agency for Research on Cancer (IARC), published performance data on 75 countries for cervical cancer screening [7]. The highest coverage with screening examination was reported in Sweden (86.3%) and the lowest in Cote d'Ivoire (2.1%). A particular vulnerability of the cancer screening programmes in terms of their effectiveness in early detection of cancer and reduction of morbidity and mortality is their failure to have participants in screening adhere to follow-up procedures in case of test results which require further diagnostics. The CanScreen5 data found that while almost all women adhered to follow up procedures in Finland, in Poland this was the case in only 39.0% of women [7]. Overall, the latest IARC report on cervical cancer found that the screening participation and coverage rates across WHO regions were (for countries with data), as follows: 40.8% in the European region, in the WHO African region ranged from 0.9% to 50.6%, in the WHO Eastern Mediterranean region ranged from 5% to 70%, WHO region of the Americas: North America was 73.5% in Canada and 79.5% in the USA, WHO region of the Americas: Latin America and the Caribbean ranged from 36.6% to 85%, the WHO South-East Asia region ranged from 2.8% to 61%, and in the WHO Western Pacific region ranged from 12.8% to 72.1% [8].

Research has indicated numerous factors that influence participation in cervical cancer screening. Women who are smokers, who engage less in physical activity, who are obese, who lead unhealthy lifestyles, with low educational level and of low socioeconomic status are less likely to participate in cervical cancer screening [8, 9]. Also, living in countries with lower human development index and less developed healthcare infrastructure is associated with lower levels of participation. In addition, many studies have pointed out the importance of psychological factors that influence participation in screening, as well as potential psychological consequences of screening that affect adherence to further procedures. Anxiety and fear of the screening procedures, gynecological exam, pain, occurrence of cancer, loss of reproductive ability and death were reported as barriers to screening [8].

Negative psychosocial impact, including worry and depression, was often related to inadequate knowledge of cervical cancer and lack of or unsatisfactory information provided by the healthcare providers, as well as lack of support from the environment (partner, family, friends).

Another indicator that is very important for the success of a cancer screening programme is adherence to further diagnostic procedures following a positive screening test. Not many countries provide data on this parameter, even though it is considered to have a bigger impact on cervical cancer incidence and mortality than screening coverage [8].

Among women who attended screening and were directed to further diagnostics, the rates of adherence to follow-up ranged from 25% in Peru, 35% in Brazil and 39% in Poland to 100% in Hungary (note: colposcopy was most often performed as part of the primary visit), 98.8% in Finland and 97.7 in the United Kingdom (Wales) [7, 8].

Methods

A literature review was carried out. The electronic database that was searched was PubMed, from inception until August 2024. A combination of the following keywords was used: "anxiety", "depression", "cervical cancer screening" (Table 1). There were no language restrictions. The studies that were considered involved quantitative studies with study population of women who did not have cervical cancer and who were invited to participate and took part in the cervical cancer screening programme of their country, involved studies that measured anxiety and/or depression in these women during the screening. Studies that were not considered involved women with cervical cancer, lack of assessment of anxiety and/or depression, studies not done in humans, qualitative studies, studies that were case reports, case series, reviews or meta-analyses, editorials. In addition, the reference lists of considered studies as well as reviews were hand searched for potentially relevant studies.

Table 1: Database search string	
Database	Search query
PubMed	("anxiety"[MeSH Terms] OR "anxiety"[All Fields] OR "anxieties"[All Fields] OR "anxiety s"[All Fields] OR ("depressed"[All Fields] OR "depression"[MeSH Terms] OR "depression"[All Fields] OR "depressions"[All Fields] OR "depression s"[All Fields] OR "depressive disorder"[MeSH Terms] OR ("depressive"[All Fields] AND "disorder"[All Fields]) OR "depressive disorder"[All Fields] OR "depressivity"[All Fields] OR "depressive"[All Fields] OR "depressively"[All Fields] OR "depressiveness"[All Fields] OR "depressives"[All Fields])) AND (("uterine cervical neoplasms"[MeSH Terms] OR ("uterine"[All Fields] AND "cervical"[All Fields] AND "neoplasms"[All Fields]) OR "uterine cervical neoplasms"[All Fields] OR ("cervical"[All Fields] AND "cancer"[All Fields]) OR "cervical cancer"[All Fields]) AND ("diagnosis"[MeSH Subheading] OR "diagnosis"[All Fields] OR "screening"[All Fields] OR "mass screening"[MeSH Terms] OR ("mass"[All Fields] AND "screening"[All Fields]) OR "mass screening"[All Fields] OR "early detection of cancer"[MeSH Terms] OR ("early"[All Fields] AND "detection"[All Fields] AND "cancer"[All Fields]) OR "early detection of cancer"[All Fields] OR "screen"[All Fields] OR "screenings"[All Fields] OR "screened"[All Fields] OR "screens"[All Fields]))

Findings and Discussion

The literature search yielded 586 hits. The body of research on the psychological consequences of HPV testing, cytology testing and colposcopy is large, however the context is not always that of these investigations being conducted as part of the cervical cancer screening programmes, which is the scope of this review. It is important to consider those specific circumstances related to screening, as it is the adequate way to obtain results that inform the transformation and advancement of screening practices, consequently improving their success.

Most of the considered studies were conducted in Europe and America. According to the study design, the majority of studies were observational (cross-sectional – standalone or nested within a randomized controlled trial, cohort), but there were also randomized controlled trials, mostly involving interventions related to different means of providing information regarding the screening procedures. Some studies involved follow-up and repeated surveys at different time intervals throughout the follow-up period (ranging up to 5 years). The studies reported different screening practices – most often HPV testing alone or combined with cytology, cytology alone, cytology and colposcopy, self-administered testing.

Studies more often investigated anxiety, than depression. The psychosocial burden was estimated at different time points – prior to the screening test (after receiving an invitation to participate), right after the screening test (and before receiving results), irrelevant of the results or after the initial screening test that showed abnormality that warranted further diagnostic procedures, and throughout the follow-up procedures. Different instruments were used to assess anxiety and depression: the Hospital Anxiety and Depression Scale (HADS), the Center for Epidemiologic Studies Depression (CES-D) questionnaire, the State Trait Anxiety Inventory (STAI), Patient Health Questionnaire 4 (PhQ-4), Beck Anxiety Inventory, GAD-7, Kessler. Therefore, comparing the reported estimates of psychological burden is not

simple. Studies that used unvalidated questionnaires or single-item questions about anxiety and/or depression were not considered.

Prevalence of depression ranged from 7.9% (basal values, prior to screening procedures) to 12.2% at 30 months following a cytological exam [10], with the prevalence of depression being lower among women who underwent colposcopy initially, opposed to a cytological test first [10]. In contrast to the differences in point prevalence of depression that showed no significant change over time, the prevalence of anxiety dd vary significantly 6 weeks post-screening procedures – dropping from 22.9% to 13.4% in women undergoing cytological surveillance, and decreasing from 23.7% to 7.9% in women undergoing colposcopy initially [10]. Similar results were confirmed in other studies, but particularly worrisome was the finding that the increased levels of anxiety at clinically meaningful levels were persisting in more than one third of women for months following the receipt of an abnormal cervical screening result [11]. In fact, women referred to colposcopy following a receipt of a positive Papanicolaou (Pap) smear screening test experience long-term psychosocial effects, including relatively slow decrease in mean anxiety levels according to STAI over the course of 2 years following participation in screening (mean score 43 at first visit vs. 35 at 2 year follow-up) [12].

As clinical knowledge evolves, the availability of healthcare resources changes and disease burden varies, countries consider and adopt changes in recommended screening procedures. For this, results of studies that investigated the levels of anxiety and depression, as factors known to influence screening participation, in different screening settings in the same population are highly relevant. Long term relative risk for anxiety and depression (according to PHQ-4) did not differ between women who were undergoing cytology screening compared to the high-risk HPV testing [13].

Expectedly, differences were noted not only depending on the applied screening procedures but also depending on the results of screening – mean scores for anxiety according to STAI questionnaire were significantly higher in women who tested HPV positive (mean scores 53.03 vs. 43.58, respectively) [14]. Other authors confirmed these findings for low grade Pap smear abnormalities [15]. Similar results were shown by Aker et al., using a different measurement tool - BAI [16]. Significantly higher levels of anxiety were noted in women with inadequate Pap smear test results (mean score according to STAI 37.8) than those with normal smear test results (mean 34.8) [17]. However, not all studies confirmed findings in terms of the presence of significant differences [18]. Similar levels of anxiety were noted in women aged 45 and over who underwent cervical cancer screening (mean STAI score 32.6; 30.0 in women with normal cytology and 34.0 in women with abnormal cytology) [19, 20]. Higher levels of cytological abnormality were accompanied by higher levels of anxiety [20]. Mean scores for anxiety according to the STAI scale were consistently higher in women with abnormal cytological results, particularly those who also tested positive for HPV, compared to those who did not [21].

The importance of each step of the screening process is evident in the higher prevalence of anxiety in women who were notified about their abnormal Pap smear results via a letter compared to a phone call by a trained healthcare professional (48.3% vs. 42.5%, respectively, according to HADS-A) and higher prevalence of depression when notification of abnormal screening results was as usual compared to intervention (13.1% vs. 8.9%, respectively, according to HADS-D) [22]. Similar results were reported by Wilkinson et al. (mean STAI score 39.00 with personalized notification letter vs. 49.59 when not sent leaflet) [23].

Not many studies assessed pre-procedural anxiety levels in cervical cancer screening. While the research showed that the prevalence of pre-procedural anxiety was about 70.3% overall

(according to STAI), a more granular analysis indicated that the pre-procedural anxiety was significantly more prevalent in women without previous screening experience 74.5% vs. 67.08% in those who attended screening previously, and the more often that women participated in screening the anxiety was less prevalent [24]. Similarly, research on anxiety and depression levels before and after follow-up diagnostic procedures that follow a positive screening test is scarce, with reported frequency of pre-diagnostic depression of 37.2% and post-diagnostic of 48.3%, according to HADS [25]. Reported anxiety prevalence was 35.2% pre- and 40.1% post-diagnostic procedures, according to HADS [26].

The importance of determining the presence of anxiety and depression using validated questionnaires must be underlined. However, despite a large body of research on psychological consequences of cervical cancer screening, there are no questionnaires specifically designed to measure anxiety and depression in these circumstances, as it is the case for many other medical situations [27]. Instead, tools that have been used after validation in population of women undergoing cervical cancer screening include the HADS, CES-D questionnaire, STAI, PhQ-4, Beck Anxiety Inventory, GAD-7, Kessler, Rosenberg scale [27]. In addition to enabling a more accurate indication of whether anxiety or depression were present or not, the use of validated questionnaires also enables a more appropriate comparison across studies conducted in different populations.

Understanding the role that anxiety has in cervical screening participation is important in order to yield solutions that strive to overcome these barriers. Namely, research has shown that self-sampling for HPV testing leads to reduced anxiety compared to provider-performed screening, as well as increased comfort and reduced embarrassment, thus being a relevant option for increasing screening rates [28], and especially in underscreened populations such as women with physical or intellectual disabilities [29].

Many studies have indicated an association between anxiety, depressed mood and depression and the risk of chronic diseases, including cancer and in particular cervical cancer [30], underlying the importance of preventing and identifying these health conditions to avert negative health outcomes.

Empowering women, increasing their resilience, increasing knowledge levels via new means of information sharing and improved communication throughout the entire screening process are essential for increasing participation rates and reducing negative psychosocial consequences of cervical cancer screening and improving women's experience [31-33].

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5. RISK FACTORS ASSOCIATED WITH BREAST CANCER IN WOMEN IN THE AUTONOMOUS PROVINCE OF VOJVODINA

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Introduction: Breast cancer remains the most frequent cancer among women worldwide and the leading cause of cancer-related deaths among women.

Objectives: The aim of the study was to identify the demographic, reproductive and lifestyle risk factors related to breast cancer onset in the population of women in the Autonomous Province of Vojvodina (AP Vojvodina).

Materials and methods: This study involved 510 women from the Autonomous Province of Vojvodina, aged 50 to 69 years

Results: The main risk factors for breast cancer by our study were age (p<0,001), hormone therapy (p=0,001), early menarche, contraceptive pill (p=0,001), family history of breast cancer (p=0,001). The other analyzed risk factors were not statistically significant.

Conclusion: This study identified several risk factors for breast cancer women living in AP Vojvodina. The findings of this research lay the groundwork for future studies in this area and can help increase awareness among women about the importance of regular screening and early detection of breast cancer. They also support the continuation and enhancement of the screening program.

Key words: breast cancer, risk factors, screening, mammography, women.

6. INCREASE IN SALES AND CONSUMPTION OF PSYCHOTROPIC DRUGS DURING A FIFTEEN-YEAR PERIOD IN SERBIA

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Introduction: Recent evidence indicates an overuse of psychotropic drugs with an average annual increase in use of 4% that varies between countries.

Objectives: The aim of this study was to examine the potential increase in the sales and consumption of psychotropic drugs during a fifteen-year period in Serbia.

Materials and methods: Our descriptive analysis used publicly available data on the sale and consumption of psychotropic drugs from the website of the Medicines and Medical Devices Agency of Serbia (ALIMS) from 2006 to 2021. Psychotropic drugs were analyzed according to the Anatomical Therapeutic Chemical (ATC) Classification System. The defined daily dose (DDD) per 1,000 people was the main outcome and provides an insight into how many inhabitants (out of 1,000) used the observed drug and were exposed to its effect in one day. Linear and "joint points" regression were used in data analysis.

Results: From 2006 to 2021, the use of 54 psychotropic drugs was examined. The use of gabapentinoid-based medications, sedatives, hypnotics, anxiolytics, antidepressants, and atypical antipsychotics has increased. The increase was linear. There were no variations in the rise in psychotropic drug usage between the pre-COVID-19 period and the COVID-19 pandemic.

Conclusion: There is an evident trend of growth in the use of psychotropic drugs, which requires further detailed causal analysis and monitoring in order to regulate the use of these drugs and improve the promotion of mental health.

Key words: psychotropic drugs, sales and consumption, mental health, ALIMS.

7. UNIVERSAL NEWBORN HEARING SCREENING AND COCHLEAR IMPLANTATION

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Introduction: One of the main benefits of universal newborn hearing screening (UNHS) is the possibility of early intervention with hearing aids or a cochlear implant (CI). After newborn screening, referral for cochlear implant assessment can be accomplished before the age of 6 months and, if appropriate, children can receive a CI by their first birthday. There is no doubt that early cochlear implantation has a significant positive effect on spoken language development, which is related to several other aspects of life. (1,2)

UNHS has led to increased identification of infant hearing loss and evaluation of impact of UNHS program on managament and outcome of deaf children.. Early screening and cochlear implantation is associated with better auditory receptive skills and speech intelligibility.(3,4,5)

Objectives: The aim of this study was to present the results of UNHS and to contribute to the implementation of a UNHS in Serbia and earlier cochlear implantation.

Methods: We started performing UNHS at the Gynaecology and Obstetrics Clinic in Nis in July, 2007. In first 8 months we screened 1,733 newborns and in first year 2421 newborns after the first day of life, using two-stage TEOAE screening test. The newborns who failed the first screening unilaterally or bilaterally were rescreened 30 days later. The newborns with risk factors for hearing loss as well as those who failed screening twice were rescreened using an ABR test.

Results: From the total number of 2421 newborns (50.3%male and 49.7 female) examined in this study, 90.8% passed the first screening, while 96.6% passed the second screening, performed a month after. 0.75% newborns were refered to additional audiological testing. Hearing loss was confirmed in 3 cases. Hearing screening significantly reduced the age of the time of diagnosis(7,9m vs 23,2m);age of the first fitting(9,6m vs 24,1m);age at the time of cochlear implantation. Out of 98 children with suspected hearing impairment were examined in ENT Clinic, CC Nis, 22,5% cases had normal hearing , mild hearing loss was diagnosed in 11,2%, moderate in 17,4% ,severe in 15,3% and profound in 31,6% cases.

Discussion: The loss to follow-up is due to lack of resources, inadequate data management systems, inconsistent reporting requirements, and lack of communication with medical professionals with regard to follow-up testing (2).Some rewies revealed that late-onset deafness, auditory neuropathy, and the alarming percentage of newborns who fail the initial testing and then are lost to follow-up are major weaknesses of neonatal hearing screening programs. It seems that parents may be satisfied of hearing screening but in a significant percentage of them do not bring their children for follow-up or further testing due to phycho-social or other reasons.(3,5)

A review by Yoshinaga-Itano et al. (2021, USA) identified positive outcomes for all four outcomes targeted by this review.UNHS leads to a lower age of identification (6,7) and a

lower age of amplification, as well as a lower age for starting early intervention services (6,7,8) in comparison to a target/risk screen, a distractor screen, and no screen/opportunistic identification.

Developmental outcomes including speech perception/production, receptive/expressive

language, literacy, social development and quality of life were better in children

early through UNHS are higher than those identified later (7,8). Particularly, children who are EID have significantly better literacy scores at ages 5–11 and 13–17 years than those who are LID.

Even the cost-effectiveness studies were limited to those from the UK and the US, they demonstrated the cost-effectiveness of UNHS in terms of savings to society (5)

Conclusions: We hope that this study will contribute to the development of a national newborn hearing screening program, wich will obtain more precise data on the incidence and prevalence of hearing loss and impairment in Serbia and lead to earlier age of cochlear implantation. The design of current UNHS programs will not probably solve problem of delayed onset SNHL. The new question is: weather reapiting mandatory testing of hearing for all children before 1 year of age will lower the one third of cochlear implanted patients who passed the screening? Is it possible to achive in developing and also developed countries?

Abbreviations

EID Early-identified

LID Late-identified

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8. THE IMPORTANCE OF USING HEARING AIDS IN AGE-RELATED HEARING LOSS

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Introduction: Presbycusis, or age-related hearing loss, is a progressive, bilateral, permanent sensorineural hearing impairment. It is a physiological process of hearing function deterioration that occurs with aging and is caused by multiple factors. Initially, presbycusis is characterized by a gradual loss of hearing at high frequencies, and, as the pathological process advances, it affects the frequencies of the speech range as well (1). In presbycusis, in addition to hearing loss, the central processing of acoustic information is slowed and speech intelligibility is reduced, especially when there is background noise (1,2). The World Health Organization (WHO) indicates that the incidence of presbycusis is constantly increasing and that it is present in one in three people over the age of 65. WHO also emphasizes that, unless appropriate preventive measures are taken, by 2050 nearly 2.5 billion people will have some degree of hearing loss, with some form of hearing intervention being necessary for 700 million people (2,3).

Hearing loss, particularly in older individuals, leads to difficulties in verbal communication, which results in reduced social activity, thereby increasing social isolation (4). Presbycusis also affects the psychological and emotional aspects of life (5,6). Research indicates that timely diagnosis of hearing loss and the use of hearing aids, along with appropriate rehabilitation, leads to improved social interaction, quality of life, and the mitigation of potential social and emotional consequences of hearing loss (5-8).

Objective: The aim of this study is to analyze the existing scientific literature on the significance of using hearing aids for age-related hearing loss.

Materials and Methods: A systematic review of the literature was conducted by searching the electronic database of the Consortium of Serbian Libraries for Unified Procurement (KoBSON), PubMed, and Google Scholar. The studies were searched using the following keywords: presbycusis, hearing loss, and hearing aids.

Results: Hearing loss in older adults leads to difficulties in understanding speech, particularly due to the presence of background noise, resulting in reduced social activity, loneliness, isolation, insecurity, and feelings of fear (1,4,5). Untreated hearing loss can affect cognitive function, mental and physical health, as well as psychosocial status (1,6,7). The use of hearing aids can improve communication and thus reduce the potential detrimental consequences of hearing loss (4,5). It is crucial to highlight the importance of auditory amplification, as there are still negative attitudes towards hearing aids and a tendency to stigmatize people with hearing impairment. It has also been found that older individuals often disregard their hearing loss, which leads to delays in diagnosis and intervention (2).

Contemporary research has shown that hearing loss can lead to some form of mental disorder more frequently than in the general population, primarily due to impaired communication and social isolation (3,4). Many studies have found higher prevalence of depression (5-9), anxiety (5,7), and stress (5) among patients with sensorineural hearing loss. A meta-analysis by Lawrence et al. documents significant prevalence of depressive symptoms in the elderly population with hearing loss (9). Literature indicates that the prevalence of clinically significant symptoms of anxiety ranges from 15.4% to 31.3% in individuals with hearing loss (10,11). Several studies suggest that the use of hearing aids can reduce depressive symptoms in patients (6,8).

An early diagnosis of hearing loss and the use of hearing aids improve the quality of life for individuals with presbycusis and reduce the risk of cognitive decline (12,13,14). It has been determined that hearing loss in midlife is one of 12 modifiable factors associated with an increased risk of developing dementia, accounting for 8%, i.e. a fifth of the modifiable risk factors (15). The use of hearing aids and cochlear implants leads to improved cognitive functions, with reduced cognitive burden when processing lower sound intensity, increased brain stimulation, and improved social engagement (8,12). Research by Huang et al. conducted in the USA shows that the prevalence of dementia correlates with the degree of hearing loss, and that the use of hearing aids reduces the prevalence of dementia in patients (16). The literature emphasizes the need for further research on the significance of using hearing aids in order to determine the therapeutic options that produce optimal cognitive enhancement, to understand the mechanism of how hearing loss correlates with dementia, and to improve quality of life (12,17,18).

It has been found that the period elapsed between the time when individuals with presbycusis become aware of their hearing loss and when they are fitted with a hearing aid is very long due to the gradual onset of hearing loss and denial of hearing dysfunction. It is often the family (especially spouses and children) and friends who are the first to notice hearing loss (1,2). When bilateral sensorineural hearing loss is present at approximately the same level and hearing amplification is needed, bilateral use of hearing aids is recommended. This allows binaural hearing which, in turn, enables the patient to determine the localization and direction of the incoming sound more precisely as well as to understand speech better, particularly when there is background noise (19, 20). In cases of severe and profound sensorineural hearing loss, i.e. when rehabilitation with hearing aids does not yield satisfactory results, cochlear implants are used (1,17).

The effectiveness of hearing aids is determined by how long and how regularly they have been used or, more precisely, the number of hours per day that a patient uses amplification (21,22). According to the study by Bruster et al., patients with presbycusis show significant improvements in hearing and cognitive function, as well as reductions in depressive symptoms, after twelve weeks of using amplification for at least nine hours a day (14).

Conclusion: Timely diagnosis of presbycusis, and appropriate auditory amplification and rehabilitation are crucial to reducing the negative effects of hearing loss. The use of hearing aids delays the onset of cognitive impairments, reduces the risk of developing dementia and Alzheimer's disease, leads to a better quality of life, and improves the psychosocial status and mental health of the patient.

Key words: presbycusis, hearing loss, hearing aids

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9. FROM TREND TO REALITY: 50 YEARS OF UNDERSTANDING BURNOUT

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Introduction: The major issues and themes have been shaped in the history of the research on burnout over the last 50 years.

Objectives: The purpose of the study is to improve work results by identifying and reducing burnout in psychosocial and economic relations of working activity and the life support system, which affect the burnout of workers.

Materials and methods: Following methods were used in obtaining results: consideration of foundations of burnout; analysis of factors contributing; systematization of signs and stages assessment of burnout levels among company employees (from literature and our research).

Results: Burnout manifests itself through physical and mental health states, beliefs, self-esteem, accomplishment and quality of work. It has been shown that the accelerated introduction of scientific and technological advancements within all spheres of public life, including work, causes an increase in the level of anxiety about one's personal achievements and their place in the society, toxic resilience and imposter syndrome which can lead to emotional breakdown and gradual burnout. Burnout among manufacturing workers and emergency medical personnel was proven to have a negative correlation with their well-being and productivity at work. Similarly burnout among teachers correlated positively with stress, work-home unbalance, symptoms of depression and sleep disorders.

Conclusion: On basis of theoretical substantiation of burnout concepts, the main conclusion and practical recommendations are made the high importance of measures to level of burnout, required knowledge of the preconditions for the occurrence of this phenomenon, factors of influence, and methods of timely prevention, which emphasizes the relevance of the research topic.

Key words: burnout, work stress, psychosocial factors, occupational health.

POSTER PRESENTATION

1. LUNG CANCER BURDEN IN THE REPUBLIC OF SERBIA

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Objectives: Analysis of the lung cancer burden in the Republic of Serbia.

Materials and methods: Data on new cases and deaths from lung cancer, as well as standardized incidence and mortality rates per 100,000 inhabitants were analyzed from the Cancer Registry of Serbia in the period 2013-2022.

Results: ccording to data on incidence and mortality, lung cancer was the leading localization in men and the second localization in women in Serbia. In 2022, a total of 6,582 new cases and 4,434 deaths from this malignant disease were registered. The incidence rate was 44.4, and the mortality rate was 27.8. The registered incidence and mortality rates were twice as high in men than in women. In the last ten years, the incidence of lung cancer increased by 21.9%, in women by 39.4%, and in men by 15%. In the same period, the total recorded drop in the mortality rate was 27%, in women by 2.5%, and in men by 38.8%.

Conclusion: According to estimates by the International Agency for Research on Cancer, residents of Serbia, together with other residents of the Western Balkans, are still in the group of countries with a higher burden of lung cancer in Europe.

Key words: burden, lung cancer, Serbia.

2. SMOKING HABIT AS A RISK FACTOR ASSOCIATED WITH OCCURRENCE OF LUNG CANCER

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Objectives: The aim of the study was to present lung cancer (LC) as a public health problem today at the global level as well as in the Republic of North Macedonia.

Matherial and methods: This is an analytical case-control study. It included all patients with a confirmed diagnosis of lung cancer (LC) with histopathological analysis (examined group) and patients who have not had any history of malignancy (control group), in a period of six months. The survey data were collected using a specially designed questionnaire.

Results: The study included a total of 82 respondents in both the examined and the control group. Regarding the habit of cigarette smoking, the largest percentage of examined respondents (56%) were current smokers, compared to the control group where the largest percentage (56%) were non-smokers. The results obtained showed that the two groups differed significantly with regards to the habit of cigarette smoking.

Conclusion: This study confirmed the association of cigarette smoking habit and lung cancer, where several variables related to smoking were examined (age at which cigarette smoking started, number of cigarettes smoked per day, duration of smoking status, type of cigarettes).

Key words: lung cancer, epidemiology, death, risk factors.

3. TRENDS IN BREAST CANCER INCIDENCE AND MORTALITY RATES IN CENTRAL SERBIA AND THE MAČVA DISTRICT

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Objectives: Breast cancer (BC) stands as the most prevalent malignant neoplasm among women globally. This research aims to analyze the trends in breast cancer incidence and mortality rates in Central Serbia (CS) and the Mačva District (MD) over a specified 16-year period (2006 to 2021).

Method: We analyzed age-standardized incidence rates (ASRs) and age-standardized mortality rates of breast cancer (BC) among females diagnosed during 2006–2021 and compared them using the Student's t-test for independent samples. Data were sourced from the Register for malignant neoplasms of Central Serbia and were used to present a linear model for the incidence rates and mortality rates of BC in CS and MD.

Results: In CS, there has been a significant increase in the incidence of breast cancer compared to the MD over the sixteen-year period, as indicated by higher ASRs in CS (64.2 ± 6.3) compared to the MD (54.8 ± 7.7) (p=0.0005). Additionally, the linear trend model has shown an increase in incidence rates within the population of CS (by 0.5% per year), while incidence rates in the MD have demonstrated a decline of 0.7% per year over the same period. Although there is a statistically significant difference in mortality rates from BC between CS and MD (19.9 ± 0.6 and 18.2 ± 2.2, respectively; p=0.005), both regions have experienced a decline in mortality rates over the same period. Mortality rates have decreased by 0.1% per year in CS and by 0.6% per year in MD.

Conclusion: Continued monitoring and targeted interventions are crucial to address the rising BC incidence in Central Serbia and reduce mortality rates in both regions. Early detection, treatment, and rehabilitation, along with palliative care, can improve outcomes. Building sustainable infrastructure for preventive measures and treatment in transitioning countries is essential for global breast neoplasms control, leading to long-term positive public health effects worldwide.

Key words: linear trend model, female, breast neoplasms.

4. RETROSPECTIVE ANALYSIS OF BREAST CANCER INCIDENCE RATES AND SCREENING IN MAČVA DISTRICT (SERBIA)

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Objectives: Breast cancer (BC) is a global public health concern with high incidence and mortality rates among women worldwide. Our study aims to conduct a retrospective analysis of age-standardized incidence rates (ASRs) for BC in the Mačva district and the conducted BC screening in the municipalities the Mačva district (Šabac and Loznica).

Methods: Data from the Register for malignant neoplasms of the Mačva district spanning 2006 to 2016 were utilized for the study. Information on the implementation of organized BC screening in Šabac and Loznica municipalities for the years 2015 and 2016 was obtained from the Screening report of the Institute of Public Health of Sabac.

Results: The coverage of organized screening programs in Šabac and Loznica was 35%, with a total of 9 newly diagnosed cases through screening out of 215 BC cases in both Šabac and Loznica combined. The average ASRs for BC before the implementation of screening (2006-2014) compared to the screening period (2015-2016) in Loznica decreased (from 54.2/100,000 to 51.3/100,000), while an increase was observed in Šabac (from 64.8/100,000 to 70.4/100,000). ASRs for BC in Šabac municipality were statistically significantly higher than in the Mačva district (p=0.001), whereas such differences were not recorded in Loznica municipality.

Conclusions: The coverage of screening programs was significantly lower than the required 75%, while a decrease in ASRs for BC was observed in the Mačva district. The implementation of preventive measures, such as education, promotion of preventive screenings, and ensuring accessible healthcare, requires coordination among all relevant institutions to achieve maximum effectiveness in the fight against breast cancer.

Key words: age-standardized incidence rates, screening report, malignant tumors of the breast.

5. MORTALITY FROM PANCREATIC CANCER IN THE REPUBLIC OF SERBIA

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Objectives: Analysis of deaths from pancreatic cancer in the Republic of Serbia for the period 2003-2022.

Materials and methods: Data on deaths from pancreatic cancer, as well as the number of inhabitants by gender and age, for the period 2003-2022., were obtained from the Republic Institute of Statistics. The obtained data were used to calculate the crude, specific and standardized mortality rate from pancreatic cancer per 100,000 inhabitants. Trends in mortality rates over a 20-year period were calculated using regression analysis.

Results: In the observed period, the average annual number of deaths from pancreatic cancer was 567 men and 497 women. The average standardized mortality rate was 8.1 for men and 5.3 for women. The highest age mortality rates were recorded at the age of 75+, equally for both sexes. In the mentioned period, a significant increase in the mortality rate was found in men by 17.2% ($p<0.005$) and in women by 19% ($p<0.000$). This importance was more pronounced in women.

Conclusion: Mortality rates from pancreatic cancer in Serbia increased in the mentioned period.. Access to early detection and timely therapy can contribute to the reduction of deaths from this malignancy.

Key words: pancreatic cancer, mortality, Serbia.

6. TRENDS IN INCIDENCE AND MORTALITY OF STOMACH CANCER: SPECIFICS OF THE NIŠAVA DISTRICT

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Introduction: Stomach cancer affects about 1 million people every year and about 700,000 people die from this type of cancer. In the mid-20th century, stomach cancer was among five leading cancers in men. In recent years, there has been a downward trend in incidence and mortality, about 2% per year, especially in the elderly.

Objectives: Analysis of the trend in incidence and mortality of stomach cancer in the Nišava District.

Materials and methods: Data on new cases and deaths from stomach cancer, as well as standardized incidence and mortality rates per 100,000 inhabitants were analyzed from the Cancer Registry of Serbia in the period 1999-2022.

Results: In the observed period, the average standardized incidence rate was 11.8 for men and 5.5 for women. The lowest standardized incidence rate in men (7.8) was recorded in 2015 and the highest in 1999 (17.6). In women, the lowest standardized incidence rate (3.0) was recorded in 2012 and the highest in 2004 (7.3). The average standardized mortality rate was 9.1 for men and 4.2 for women. The lowest standardized mortality rate for men (3.8) was recorded in 2018 and the highest in 1999 (13.5). In women, the lowest standardized mortality rate (2.5) was recorded in 2000 and 2002, and the highest in 2004 (7.2). There is a decrease in incidence and mortality rates in both sexes. This trend is statistically significant.

Conclusion: The use of chemoprophylaxis in the treatment of Helicobacter pylori infection, which is considered to be the most important risk factor for the occurrence of a malignant process in the stomach, has led to a significant decline in incidence and mortality, primarily from the intestinal type of adenocarcinoma.

Key words: trend, incidence, mortality, stomach cancer

7. THE INCIDENCE OF THYROID CANCER IN THE REPUBLIC OF SERBIA AND EUROPE

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Objectives: Analysis of the burden of thyroid cancer in the The Republic of Serbia and Europe counties.

Materials and methods: Data from the Cancer registries in Serbia and Europe counties on the standardized incidence of thyroid cancer for the period 2013-2022 were analyzed.

Results: According to cancer incidence of the thyroid gland were the 12th localization in Serbia and 7th in Europe region. In 2022 nearly 79,000 new diagnoses in Europe and 440 new cases in Serbia from these malignant tumors were registered. The standardized incidence rate were 4.3 0/0000 in Serbia and average 7.5 0/0000 in Europe. The registered standardized incidence rates in Serbia were three times as high in women (7.0) than in men (2.6). About two-thirds of cases of thyroid cancer are diagnosed in people aged 20 to 55 years. In the last ten years in Serbia, the incidence of thyroid cancer has increased by 13.8%. The incidence of thyroid cancer varies significantly in Europe. The lowest standardized incidence rates were recorded in Albania (1.1) and North Macedonia (1.4), and the highest in Hungary (16.3) and Cyprus (31.8).

Conclusion: The increase in the incidence of this cancer is probably the result of the wider use of sensitive diagnostic tools.

Key words: incidence, mortality, thyroid cancer, Serbia, Europe.

8. ACUTE CORONARY SYNDROME (ACS) MORTALITY TRENDS IN SERBIA, 2006-2022

Nataša Mickovski Katalina, Aleksandar Medarević, Dragan Miljuš, Ivana Rakočević, Snežana Plavšić, Snežana Živković Perišić, Zorica Božić
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Objectives: ACS is the most frequent cause of sudden cardiac death in developing countries. **Materials and methods:** This study analyze the trends in ACS mortality in Serbia from 2006 - 2022 by gender and age.

ACS mortality data for Serbia were used for the period 2006 - 2022 from the Serbian ACS Registry. Age-adjusted mortality rates were calculated by direct standardization for people 20+ years, using the European population as a standard and expressed per 100,000 persons. Mortality trends were assessed using joinpoint regression analysis by calculating the annual percentage change (APC) for gender and age.

Results: In observed period in Serbia, ACS mortality rates drop from 94.5 to 56.0/100,000. The greatest decline was in the period 2009-2015 (APC=-7.6; p=0.03). The biggest reduce was in the age group 60-69 in the period 2009-2012 (APC=-13.5; p=0.003).

In man, the most pronounced drop was in the period 2009-2015, with an APC of -7.7 (p=0.012), with the biggest decrease in the age group 40-49 (APC=-15.3; p < 0.001).

The biggest decline in rates in women was in 2006-2016 (APC=-5.9; p=0.026), and in age group 60-69 (APC=-9.1; p< 0.001) in period 2006-2013.

Conclusion: The establishment of PCI facilities in Serbia regarding ACS, was significantly contributed to the decline in mortality.

Key words: acute coronary syndrome, age-adjusted mortality rates, trends in mortality.

9. PREVALENCE OF RARE DISEASES IN THE REPUBLIC OF SERBIA

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Objectives: Analysis of the prevalence of rare diseases in the Republic of Serbia.

Materials and methods: Data from the Register of rare diseases in Serbia for the period 2013-2022 were analyzed. Prevalence was calculated per 10,000 inhabitants of Serbia.

Results: In this period, a total of 5914 people with rare diseases were recorded, with a prevalence of 8.48. People with rare diseases of the musculoskeletal system had the highest prevalence (3.05), followed by rare health disorders in the groups: malignant tumors (0.98), diseases of the endocrine glands (0.98), diseases of the nervous system (0.86). , congenital deformities/chromosomal anomalies (0.77), blood/blood-forming organs and immune disorders (0.45), skin/subcutaneous tissue diseases (0.18), circulatory system diseases (0.15), mental disorders/behavioral disorders (0.14), respiratory system diseases (0.12), benign tumors (0.10), genitourinary system diseases (0.05) and digestive system diseases (0.03). The lowest prevalence (0.01) was recorded for symptoms and pathological clinical findings, eye diseases, infectious diseases and injuries. At the same time, a prevalence of 0.56 was recorded in persons who had only the ORPHA code.

Conclusion: The register of people with rare diseases in Serbia is a basic resource for planning and improving the health care of people with rare diseases.

Key words: prevalence, rare diseases, Serbia

10. THE LEADING OF MUSCULOSKELETAL RARE DISEASES IN THE REPUBLIC OF SERBIA

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Objectives: Analysis of of the most common musculoskeletal rare diseases in the Republic of Serbia.

Materials and methods: Data from the Register of Rare Diseases on persons suffering from musculoskeletal diseases in Serbia for the period 2013-2022 were analyzed. The proportions of the most common rare musculoskeletal diseases were analyzed.

Results: In this period, a total of 2125 persons with rare musculoskeletal diseases were registered. Almost every third person (35.9%) in the Register of rare diseases suffers from this group of rare diseases. In the leading rare musculoskeletal diseases (85.0%), the most common were: syndrome sicca, Sjogren's (26.4%), polymyalgia rheumatica (12.3%), lupus erythematosus systemicus, nonspeciatus (7.3%), lupus erythematosus sistemosus systematic apprehendenti (6.8%), polyarthritis juvenilis, seronegative (6.0%), lupus erythematosus systemicus, formae aliae (5.6%), arthritis juvenilis oligoarticularis (5.1%), scleroderma progressivum diffusum (3.8%), non-specific Sclerosisatum (4.8%), systemic non-specific (4.8%). %), CREST syndrome (3.8%), nodi lymphatici mucocutaneum, Kawasaki syndrome (1.5%) and arthritis juvenilis rheumatoides (1.2%).

Conclusion: Rare musculoskeletal disorders represent a wide spectrum of phenotypes and mechanisms that occur at all ages. We emphasize the need to conduct research that would improve our understanding of the mechanisms of pathogenesis, the burden on society and the poorer quality of life of patients with these diseases.

Key words: leading, musculoskeletal rare diseases, Serbia

11. EPIDEMIOLOGICAL CHARACTERISTICS OF CHILDREN WITH PERVASIVE DEVELOPMENTAL DISORDERS IN THE REPUBLIC OF SERBIA

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Objectives: Analysis of some epidemiological characteristics of children with pervasive developmental disorders (PDD) in the Republic of Serbia.

Materials and methods: Data from the Register of children with disabilities in Serbia, for children aged up to 19 with a diagnosis of PDD in the period 2014-2023, were analyzed.

Results: In this period, a total of 1625 children with PDD were recorded, four times more boys (1298) than girls (327). On average, the diagnosis of these disorders was made at the age of 9, and the most common diagnoses were: autism puerile (39.7%), disordines evolutionis pervasivi (28.2%) and disordo evolutionis pervasivus, non specificatus (23.8%). Asperger's syndrome (4.2%), disordines evolutionis pervasivi alii (1.6%) and autismus atypicus (1.5%). The fewest children had diagnoses: hyperkinesia cum retardatione mentali et motibus stereotipicis (0.6%), Rett's syndrome (0.2%) and disordo pueritiae disintegrativus alius (0.2%). Approximately half of these children had severe and complete difficulties in some of the assessed activities in the domain of cognitive and socioemotional functions, while the mentioned difficulties in the domain of senses were not recorded.

Conclusion: Registration of children with PDD is a starting resource for planning, improvement of health care and early inclusion of children in interventions for better outcomes in later periods of life.

Key words: children, pervasive developmental disorders, Serbia.

12. LIFETIME HISTORY OF CONTRACEPTION USE IN WOMEN WHO HAD AN INDUCED PREGNANCY ABORTION

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Introduction: Having adequate information and access to contraceptives is essential to maintain sexual and reproductive health of women and prevent induced abortions due to unplanned and unwanted pregnancies.

Objective: The study aim was to assess lifetime history of contraception use in women who had an induced pregnancy abortion.

Methods: Women who were having induced abortions at the Clinic for Ob/Gyn, University Clinical Center of Serbia from 2022 to 2024 were included in the study. Participants were asked about their socio-demographic data, general medical and gynecological history, knowledge about contraception and previous contraception use. Data were analyzed using descriptive and analytical statistics.

Results: The study encompassed 433 women out of which 81.1% used some method of contraception at least for some time during their reproductive life, while 18.9% never used any method of contraception. In our sample, condom was the most frequently used (70.4%), while other barrier methods and spermicides were the least frequently used (0.7%) contraceptives. Women who never used contraception were national minorities, had a lower level of education, chronic illnesses, fewer deliveries and inadequate knowledge about contraceptive methods.

Conclusions: Contraception counseling should especially focus on women who are national minorities in Serbia, who have different illnesses and medical conditions and, therefore, may not be able to use all contraception methods, less educated women and those who might want to maintain their fertility. Adequate knowledge about contraception methods (benefits, way of use, side-effects and risks) is the main factor that can influence women to use contraception.

Key words: contraception use, contraception knowledge, induced abortion.

13. SATISFACTION WITH WORKING CONDITIONS AMONG EMPLOYEES IN PRIVATE SECURITY IN CENTRAL SERBIA

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Introduction: Although job satisfaction is an important aspect of employee well-being, there is no standard definition of this term.

The **objective** of the paper was to explore the satisfaction with working conditions among employees in the private security sector. A multicenter questionnaire-based study was conducted on a representative sample of employees in seven cities of central Serbia during 2019.

Results: A total number of responders was 353 (330 males and 23 females) and the response rate was 80% (353/439). The average age of the employees was 43.62 ± 11.37 years. A total of 225 (63.7%) employees reported being satisfied with their working conditions ($p<0.10$). The odds ratio (OR) for the category „neither satisfied nor dissatisfied" compared to the reference category „satisfied" was 0.494, with a 90% confidence interval (CI) for the OR of 0.307-0.796. The results of the multivariate logistic regression indicate that the variable „working conditions" is significant at $p<0.10$. The OR for the category „not satisfied" compared to the reference category „satisfied" was 3.809, with a 90% CI for the OR of 1.702-8.525.

Conclusion: If an employee was neither satisfied nor dissatisfied with working conditions, the probability of exhibiting emotional exhaustion increases by 50.5% compared to employees who were satisfied. Employees who were not satisfied with their working conditions have a 280% increased probability of experiencing overall job burnout.

Key words: job satisfaction, private security sector, burnout.

14. TWO DECADE OF SUICIDES IN THE NORTH BANAT DISTRICT: SOCIOECONOMIC CHARACTERISTICS BY GENDER

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Introduction: Suicides occurs in all periods of human history, affecting individuals of all ages, nations, cultures, religions and genders.

Objective: The aim of this study was to analyse differences in socioeconomic characteristics and prior mental illness by gender among persons who committed suicide in the North Banat District,Vojvodina Province.

Methods: Descriptive retrospective study from 2003 to 2022 was performed. Data was collected from the Ministry of Internal Affairs Police Department of Kikinda. Existence of any association by observed variables were determined using the χ^2 test, and Student's t test. All analyses were performed using the SPSS v24.0 computer software programme. Statistical significance was set at $p < 0.05$.

Results: During two decades from a total of 815 persons committed suicide, 186 (22.8%) were females. Females compared to males were significantly older (61.58±15.35 vs 57.61±17.35, p=0.04), more common less educated (without primary school education (9.0% vs 3.8%, p=0.001)), more often widows (36.5% vs 15.2%, p<0.001), economically inactive (22.8% vs 54.0%, p<0.001), and commonly with prior reported mental disease (45.5% vs 35.1%, p=0.01)

Conclusion: Results of this study shows same important differences by gender. Increasing prevalence of mental diseases, ageing of our population with expected increasing impact of chronic and mental diseases point out the necessity of continuous suicide prevention among elderly.

Key words: suicides, gender differences, aging, mental diseases, Vojvodina.

15. MEDICATION ADHERENCE AND QUALITY OF LIFE IN RENAL TRANSPLANT RECIPIENTS

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Objectives: The aim of this study was to evaluate the adherence in renal transplant recipients and to identify risk factors for nonadherence. Additionally, the goal was to assess the quality of life of these patients.

Materials and methods: A cross-sectional study was conducted at the Clinic of Nephrology, University Clinical Center in Niš, involving 45 renal transplant recipients. Adherence and quality of life were assessed based on the following questionnaires: BAASIS, ITBS, SF-12v2.

Results: The extent of nonadherence with immunosuppressant regimens was 35.55%. Patients with a longer post-transplantation period and fewer drugs in therapy showed a significantly lower degree of adherence ($p < 0.05$). The main reasons for low adherence were changes in daily routines (37.5%) and forgetfulness (6.25%). Multiple factors were identified in 56.25% of respondents. Patients with fewer medications in therapy showed better results in all categories of quality of life. Male patients showed better results in all categories of mental health and bodily pain, while females reported better general health and fewer limitations due to physical health in performing daily activities.

Conclusion: Identifying the reasons for nonadherence is the basis for taking measures and interventions to improve it for a better quality of life of renal transplant recipients.

Key words: adherence, renal transplant recipients, nonadherence factors, quality of life.

SESSION: **THEORETICAL AND PRACTICAL PROBLEMS OF -COMMUNICABLE DISEASES**

INVITED LECTURE:

1. THE IMPACT OF COVID-19 PANDEMIC ON HEALTHCARE-ASSOCIATED INFECTIONS AND COVID AS A HEALTHCARE-ASSOCIATE INFECTION

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Objectives: To evaluate the impact of the COVID-19 pandemic on healthcare-associated infections (HAIs) occurrence among patients admitted to hospitals during the COVID-19 pandemic and to describe COVID-19 infections acquired in hospitals.

Materials and methods: A narrative literature review of the current knowledge concerning COVID-19 and HAI was used.

Results: One of the major patient safety concerns during hospitalization is the occurrence of HAIs. These infections are potentially preventable through compliance with infection prevention and control (IPC) recommendations. The COVID-19 pandemic that began in December 2019 has influenced IPC practices and led to their disruption. This potentially impacts the incidence of HAIs and transmission of multidrug-resistant organisms. It was revealed that the increase in the overall infection rate appeared to be entirely due to HAIs in COVID-19 patients. The Central-Line-Associated Bloodstream Infections and Catheter-Associated Urinary Tract Infections rates are 4-fold and 3-fold higher in the COVID-19 than the non-COVID population. The connection between *C.difficile* infections and COVID-19 is subject to debate. Besides, patients who contracted COVID-19 infection in the hospital can be the sources of transmission to other hospitalized patients. Hospital-related epidemics of COVID-19 have been described.

Conclusion: HAIs represent a significant challenge to patient safety in hospitals. The increase in HAI incidence during the COVID-19 pandemic highlights the need for further actions to mitigate this threat.

Key words: COVID-19, helathcare-associatd infections, pandemic, impact.

2. FAKE NEWS, CONSPIRACY BELIEFS AND COVID-19 VACCINATION

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Conspiracy theories are used to explain events and situations, but cause considerable anxiety and uncertainty in the community, which make them prone to accepting misinformation and disinformation. Vaccine hesitancy has been acknowledged at the very early stages of the pandemic as the major challenge to the global control the COVID-19 spread. The underlying causes of vaccine hesitancy are often beliefs in conspiracy theories. Some Internet websites, provided different information that contradicted the formal sources of information, which perpetuated vaccine hesitancy and misinformation. Evidence suggested that holding beliefs in COVID-19-related conspiracies was strongly associated with the intention not to receive the COVID-19 vaccines at the beginning of the pandemic. Nevertheless, vaccinated people and their opinions are often forgotten, since the vaccination coverage is of paramount importance in the pandemic circumstances. However, when people comply with the recommendations without actually trusting the officials, they still can hold and convey false beliefs about the pandemic. To this end, these people can foster mistrust in the officials that may further thrive, resulting in non-compliance to vaccination in future pandemics. In the framework of the current pandemic, vaccinated people can still reject vaccination of their children or advocate for vaccination among their family, relatives, and friends. Yet, the evidence of misbeliefs and their effect on wellbeing among the vaccinated people is sparse, because, thus far, the body of scientific evidence focused on misbeliefs of people who refuse vaccination. This presentations focuses on misbeliefs about COVID-19 vaccination among people who were vaccinated.

Key words: COVID-19, vaccination, fake news, conspiracy theories, misbeliefs.

3. THE LESSONS WE HAVE LEARNED FROM THE MEASLES OUTBREAKS IN THE PAST 17 YEARS IN AP VOJVODINA

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Abstract

Introduction: Before the introduction of mandatory measles immunization in Serbia in 1971, large measles outbreaks in the Autonomous Province of Vojvodina (Vojvodina) were initially recorded every 1–3 years, with predominantly preschool children being infected. During the vaccine era, measles incidence in Vojvodina dropped dramatically. In the period between 2001 and 2006 there were no measles cases registered.

Material and Methods: A descriptive epidemiological study was conducted using data of the Centre for disease control and prevention of the Institute of Public Health of Vojvodina. The data for this study were collected from 2007 to 2023 (17 years) during which we described the epidemiological characteristics of four measles outbreaks (2007, 2014-2015, 2017-2019, and 2023) in Vojvodina.

Results: A measles outbreak with 200 cases, mostly among unvaccinated hard-to-reach Roma children, occurred in Vojvodina in 2007. This outbreak was imported from Bosnia and Herzegovina, as well as a second one during 2014-2015, when a total of 93 measles cases were reported among predominantly unvaccinated students of the University of Novi Sad, originating from Bosnia and Herzegovina. The last large measles outbreak in Vojvodina started in 2017 and represents the part of the largest outbreak of measles in Serbia during the last 30 years. In the last and smallest measles outbreak in Vojvodina (part of the measles outbreak in Serbia), there were only 3 measles cases in Vojvodina. During three consecutive measles outbreaks after the 2007, when 37% of measles cases were aged ≥20 years, out of the total cases, 87% (2014-2015), 75% (2017-2019), and two out of three cases (2023) belonged to individuals aged ≥20 years. According to the vaccination status against measles, there were 86% unvaccinated patients in 2007 outbreak. Additionally, out of all measles cases in the 2014-2015 outbreak, 80% of patients were unvaccinated or had an unknown measles-containing vaccine (MCV) status, 14% had received one dose of MCV, and 6% had received two doses of the MCV. In the 2017-2019 outbreak, 38% of measles cases were unvaccinated or had an unknown MCV status, 7.3% had received two doses of the MCV, and 54.7% of patients were vaccinated with one dose of MCV. Finally, the last three measles cases that were recorded in 2023 were unvaccinated, had received one dose of the MCV, and had an unknown MCV status, respectively.

Conclusion: To prevent new outbreaks and achieve the elimination of measles, it is essential to enhance and maintain the vaccination coverage for both measles-mumps-rubella (MMR1 and MMR2) vaccines. This goal can be attained through the implementation of educational campaigns, aimed at improving the acceptance and timely administration of the MCV vaccine among healthcare workers and the general population.

Key words: Measles, outbreaks, vaccine, Vojvodina, Serbia.

Introduction

Measles is a highly contagious, potentially fatal, but vaccine-preventable disease [1]. In comparison with other common childhood illnesses (e.g., influenza, pertussis), the basic reproduction number for measles is higher and estimated to be 12–18. In the prevaccine era, measles was an almost inevitable childhood illness [2].

Case definition of the measles include fever, maculopapular rash, and at least one of cough, coryza, or conjunctivitis. Vaccinated persons can have milder or even no symptoms [3]. It is estimated that approximately 30% of measles cases developed one or more complications, and they are most common among children age younger than 5 years and adults. Complications often include otitis media, stomatitis, diarrhoea, laryngotracheobronchitis and pneumonia. Among unvaccinated persons, pneumonia is the most common serious complication of measles, and can be caused by the measles virus itself or by secondary bacterial infection. Uncommon but very serious neurological complications of measles can occur during or soon after the acute disease (e.g., acute disseminated encephalomyelitis) or months or even years later (e.g., measles inclusion body encephalitis and subacute sclerosing panencephalitis) [3, 4].

There is no specific antiviral therapy for the treatment of measles, and disease control largely depends on prevention. However, although a safe and effective vaccine has been available for nearly 60 years, measles is still endemic in many countries and causes substantial morbidity and mortality, especially among children in resource-poor settings [3]. Measles is still responsible for more than 100,000 deaths every year, down from more than 2 million deaths annually before the introduction (in the 1960s) and widespread use of measles vaccine [5]. Estimated mean measles case–fatality ratios (CFRs) in low-income and middle-income countries, in 2019, for people aged 0–34 years, were 1.32% among community-based settings and 5.35% among hospital-based settings. More specifically, estimated CFRs in community-based settings were 3.03% for children younger than 1 year, 1.63% for age 1–4 years, 0.84% for age 5–9 years, and 0.67% for age 10–14 years [6].

The low case numbers reported in 2020, after a worldwide resurgence of measles between 2017 and 2019, have to be interpreted cautiously, owing to the effect of the COVID-19 pandemic on disease surveillance. Disrupted vaccination activities during the pandemic increase the potential for another resurgence of measles in the near future, and effective, timely catch-up vaccination campaigns, strong commitment and leadership, and sufficient resources will be required to mitigate this threat [3].

Considering the high value of the basic reproduction number for measles, under the assumption of a homogenously mixing population, such high transmissibility means that significantly high population immunity levels of >92%–94% are needed to impede sustained measles virus transmission [2].

There is a consensus that urgent efforts are needed to increase stagnating global coverage with two doses of measles-containing vaccine (MCV) through advocacy, education, and the strengthening of routine immunisation systems. Use of combined MMR (measles, mumps, and rubella) vaccines provides an opportunity to eliminate rubella and congenital rubella syndrome. Ongoing research efforts, including the development of point-of-care diagnostics and microneedle patches, will facilitate progress towards measles elimination and eradication [5]. Although all six WHO regions committed to the elimination of measles by 2020, only the region of the Americas documented elimination in 2016 [3].

Reporting of measles cases in the Autonomous Province of Vojvodina (Vojvodina) began in 1948. Before the introduction of mandatory measles immunization, measles occurred in a cyclical endemic-epidemic pattern. More precisely, large measles outbreaks in Vojvodina were initially recorded every 1–3 years, with predominantly preschool children being infected. The highest incidence rate of measles (768.78 per 100,000 inhabitants) during the prevaccine era in Vojvodina was registered in 1970. One year later, in Serbia, mandatory measles immunization for all children aged 12–15 months with a single monovalent dose was introduced. Combined measles-mumps (MM) vaccine became available in 1986, and in 1993, the MM vaccine was replaced with a combined MMR vaccine. In 1994, a two-dose schedule using MMR at age 12–15 months and 12 years was implemented. Second dose was moved to preschool age (6–7 years) in 2006. During the vaccine era, measles incidence in Vojvodina dropped dramatically. In the period between 2001 and 2006, no measles cases were registered [7]. However, there were a few measles outbreaks after this. We aimed to evaluate the main epidemiological characteristics of measles outbreaks in Vojvodina during a period of 17 years (2007-2023) and to discuss future preventive measures.

Materials and methods

A descriptive epidemiological study was conducted. Surveillance data of measles cases in Vojvodina from 2007 to 2023 were used. Data for the analysis were obtained from the Institute of public health of Vojvodina, Novi Sad. A suspected measles case is defined as a patient with fever and a maculopapular rash and at least one of the following three symptoms: cough, coryza or conjunctivitis. Final classifications of measles cases as clinically compatible, epidemiologically linked or laboratory confirmed cases as well as definition by origin (endemic, imported, import-related, unknown) were done according to the WHO criteria [8, 9]. According to the previously described methodology, sera for the detection of measles-specific IgM antibodies were collected within 3–28 days after rash onset, while nose/throat swabs for detection of viral RNA were obtained within seven days of rash onset [10]. The National Reference Laboratory for measles is the Institute of Virology, Vaccines and Sera "Torlak", Belgrade.

Ethical consideration

This investigation was considered as a public health surveillance, and no clearance by Ethics Committee for this response was required in Serbia.

Results

During the study period, there were four measles outbreaks in Vojvodina. The importation of measles cases for the first two outbreaks was from Bosnia and Herzegovina, but for the last two, endemic occurrence was recognized. The highest number (n=200) of registered measles cases was recorded in the 2007 outbreak with an incidence rate of 9.8 per 100,000 inhabitants. In the last outbreak in 2023, only three measles cases were recorded (0.2 per 100,000 inhabitants) (**Table 1**).

Characteristics of the measles outbreak in Vojvodina, 2007

In outbreak during 2007 in Vojvodina, there were 200 laboratory-confirmed measles cases. Patients were registered across all age groups, with the majority of cases (74 out of 200; 37%) occurring in patients aged ≥20 years. Out of all registered cases, only 14% patients were vaccinated with one or two doses of MCV. Regarding age group of patients, the highest incidence rates of measles were recorded in patients aged 10-14 (33.7 per 100,000) and 0-4 (33.5 per 100,000) years, while the lowest incidence rate (4.7 per 100,000) of measles was detected among patients aged ≥20 years (**Table 2, Table 2a**).

Characteristics of the measles outbreak in Vojvodina, 2014-2015

First imported cases of measles in outbreak 2014-2015 in Vojvodina were recorded among unvaccinated students from Bosnia and Herzegovina who studied in the University of Novi Sad. After this, there were 14, and 79 measles cases registered in 2014 and 2015, respectively. The highest incidence rates of measles were detected among children aged 0-4 years (3.4 per 100,000 in both 2014 and 2015), and in age group ≥20 years (4.7 per 100,000 in 2015). During the 2014-2015 outbreak in Vojvodina, there were no patients aged 10 and 14 years (**Table 3**). Regarding vaccination status in this outbreak, there were 79.6% (74/93) unvaccinated patients or with unknown MCV vaccination status, 14% (13/93) had one and 6.4% (6/93) had two doses of MCV. All three patients aged 1-6 years and every tenth patient aged ≥15 years received a single dose of MCV (**Table 3a**).

Characteristics of measles outbreak in Vojvodina, 2017-2019

During three consecutive years (2017-2019), in the outbreak in Vojvodina, a total of 179 measles cases were registered. The majority percentage (82.7%) of cases was recorded in 2018, while 14.5% patients were registered in 2017, and 2.8% in 2019. In 2017 and 2018 years, the highest incidence rates (23.1 and 75.1 per 100,000, respectively) of measles were noticed in the youngest (under one year) age group, while in 2019, only patients aged 30-49 year were recognized. Observed all three years of outbreak, patients aged ≥20 years participated with 75% (135/179) in the total registered cases of measles (**Table 4**). The majority of the measles cases (98/179; 54.7%) in Vojvodina were previously vaccinated with one dose of MCV. Patients aged 5-19 years were mainly vaccinated with two doses of MCV, while patients aged ≥20 were unvaccinated or with unknown vaccination status or received one dose of MCV (**Table 4a**).

Characteristics of measles outbreak in Vojvodina, 2023

In the last observed outbreak, there were three cases (aged 9, 38 and 42 years) of measles, and their main characteristics are described in Table 5. Regarding the date of rush onset, two cases were laboratory-confirmed using the RT-PCR technique, while the third case was confirmed through serology (ELISA) testing. First case of measles in 2019 previously had contact with laboratory-confirmed case of measles during hospitalization at the University Children's Clinic "Tiršova", Belgrade, and, after this, transmitted infection to next patient at the Institute for Child and Youth Health Care of Vojvodina, Novi Sad. The status of the third measles case is debatable, given that she simultaneously tested positive for IgM antibodies to measles, *Parvovirus B19*, *Coxsackie* B, and *Echoviruses*. Considering the lack of an epidemiological link with other suspected/confirmed measles cases, along with simultaneous IgM positive results for several different viruses, this case could potentially be classified as a case with a "cross-reactivity" reaction.

Discussion

This study describes a thorough retrospective analysis of the measles outbreaks in Vojvodina during 17 years (2007-2023) period, thereby providing important information on how to counteract the future.

The first mentioned outbreak occurred in 2007 when there were 200 measles cases, mostly among unvaccinated, hard-to-reach Roma children. The first import case of this outbreak was from Sarajevo (Bosnia and Herzegovina), and the outbreak began on January 15, 2007. During this outbreak, it was noticeable that members of the Roma population did not always receive vaccinations, as many move frequently, do not attend school, or have not registered with health services. Consequently, there was no reliable information about the vaccination coverage in the Roma population [11].

In order to investigate all contacts in the outbreak territory, more than 2000 people were involved. During this outbreak, 350 patients who fulfilled the case definition of measles were laboratory tested, and more than 7000 inhabitants in Vojvodina were vaccinated against measles. Seventy patients were hospitalized, with no lethal outcome [12].

The next import-related outbreak of measles in Vojvodina began in November 2014 and lasted until April 2015. Similar to the previous outbreak, the importation of this outbreak was linked with neighbouring Bosnia and Herzegovina. Specifically, this outbreak was primarily observed among students born in Bosnia and Herzegovina during the war or post-war period (1992–1998) who were either unvaccinated or had an unknown vaccination status and were studying at the University of Novi Sad [9]. At the same time, in Republika Srpska (Bosnia and Herzegovina), nearly 4000 measles cases were recorded. Nearly 80% of the registered cases were unvaccinated against measles or had an unknown MCV status [9, 13].

The measles outbreak, which occurred during three consecutive years (2017-2019) in Vojvodina, was part of the largest outbreak in Serbia in the past 30 years, when nearly 5800 measles cases were recorded. In this outbreak in Serbia, every third case was hospitalized, and 15 lethal outcomes were registered [14]. On the other hand, a total of 179 measles cases were recorded in Vojvodina, which accounted for only 3% of all reported measles cases in the entire territory of Serbia in the 2017-2019 period. The majority (148 out of 179; 82.7%) of measles cases in 2018 were recorded. Immunization coverage rates for children in Vojvodina in 2016 and 2017 (prior to this outbreak) were 89% and 78% for MMR1 vaccine (second year of life), and 91% and 93% for MMR2 vaccine (prior to entrance in the school), respectively [7]. A significant number of patients in adult age groups was detected. In accordance with this it was expectable that many of cases were vaccinated with one dose of MCV (54.7%) or were unvaccinated or with unknown MCV status (38%).

Serosurveys are considered useful for assessing the immunity profile of a population and identifying geographical areas and cohorts with immunization gaps [3]. Accordingly, we previously conducted a cross-sectional serosurvey of measles-specific IgG antibodies, analyzing a total of 3199 residual diagnostic sera from participants in Vojvodina during the inter-epidemic period (April 2015 to June 2017). Our results indicated that cohorts of participants from the pre-immunization period exhibited an average measles seropositivity of 98.6%. For cohorts from the single measles monovaccine period, the measles seropositivity was 73.7%, which then increased to 81.5% and 88.8% for participants from the single combined MM vaccine period and the two-dose combined MMR vaccine period, respectively [15]. The most significant finding from the aforementioned serosurvey study was that the highest proportion of measles seronegativity found among children aged 12–23 months and adults aged 20–39 years. It is precisely these age groups that were most affected during the measles outbreak from 2017 to 2019.

During the last outbreak in Vojvodina (which occurred in 2023), the reported measles cases were aged 9, 38, and 42 years.

In densely populated urban settings with low measles vaccine coverage, the average age of infection is low and measles most frequently registered among infants and young children. As measles vaccine coverage increases, or the rate of contact between susceptible and infectious individuals decreases, the age distribution of measles shifts toward older children. With increasing vaccination coverage and levels of population immunity, the age distribution of measles is further shifted into adolescence and adulthood. Following recent progress in increasing measles vaccine coverage, many countries now face a changing epidemiological profile in which a higher proportion of measles cases occur in adolescents and adults, albeit with a lower number of measles cases [5].

Similar to the aforementioned findings, we observed a shift in the age distribution of measles cases during observed outbreaks in Vojvodina, from preschool-aged children (in 2007) to adolescents (in 2014/2015) [10-12], and subsequently to adults [15]. In addition, contrary to the first two mentioned outbreaks, during 2007 and 2014-2015 (when mostly unvaccinated subjects were infected) [12, 13], in the 2017-2019 outbreak, the majority of reported cases were vaccinated with one dose of MCV according to their age. Similar upward shift in the age of measles cases to older age groups was well described in other regions [16, 17].

As previously mentioned, the 2007 outbreak primarily affected hard-to-reach Roma children. Interestingly, subsequent measles outbreaks in Vojvodina did not record significant cases within this vulnerable population. This success is likely attributed to the comprehensive measures taken during the 2007 outbreak, which included an expansive catch-up immunization campaign against measles and a concerted effort to officially register Roma children at Government Health Care Centres for future vaccination. This practice persisted beyond the conclusion of the 2007 measles outbreak, resulting in a consistently satisfactory level of measles vaccination coverage within the Roma population.

According to the reports of the European Centre for Disease Prevention and Control (ECDC), there has been a substantial decline in cases of measles reported by EU/EEA countries since March 2020. This decline has continued through 2022 and into 2023, contrasting with the usual annual and seasonal pattern for measles, which typically peaks during spring in temperate climates. A similar decrease has been observed in other countries worldwide during the same period. However, it appears that these reports vastly underestimate the true number of measles cases in the EU/EEA countries. Under-reporting, under-diagnosis, or a genuine decrease due to the direct or indirect effects of the COVID-19 pandemic measures could explain the observed decline in cases. As a result, the ECDC has recommended active measles surveillance and public health measures, including high vaccination uptake. These actions can provide a foundation for a proper response to potential increases in the number of cases or outbreaks [18].

There is no doubt that the burden of measles, including pneumonia, blindness, chronic neurological conditions, and death, has significantly decreased due to measles vaccination [5]. Additionally, it is a well-established fact that the declining trend in measles immunization has contributed to the occurrence of measles outbreaks. Several factors have contributed to the decrease in MMR vaccine coverage in our region: a lack of consistent availability of the MMR vaccine in Serbia during the 2012–2016 period, scepticism towards the MMR vaccine fuelled by negative media messages, and the growing influence of the anti-vaccination movement in the Balkan countries [7, 15, 19, 20]. Similar to experiences in other settings [21], strong parental insistence on postponing primary vaccination, especially with the MMR vaccine, sometimes leads to challenges for paediatricians in our region. As a result, the first MMR dose may be administered later in childhood than initially scheduled. Despite the mandatory measles immunization in Serbia, delaying MMR vaccine administration typically does not lead to significant consequences for parents.

In **conclusion**, identifying susceptible age groups is vital for targeted supplementary immunization efforts to avert the possibility of larger-scale measles outbreaks in the future. To enhance acceptance and timely vaccination against measles among both healthcare professionals and the general population, focused educational campaigns are crucial. These campaigns should underscore the well-established effectiveness and safety of the MMR vaccine, emphasizing its high tolerability as well as the fact that mild reactions following this vaccination are common [2].

On the other hand, during outbreaks of measles, several control measures can be implemented, including prompt information and focused communication, the exclusion of infectious cases, prophylactic treatment, and vaccination of susceptible contacts [22].

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SUPPLEMENT

Table 1. Number of measles cases during outbreaks in Vojvodina, 2007-2023

Year	Importation	No of cases	Inc. per 100,000 inhabitants
2007	Sarajevo - Bosnia and Herzegovina	200	9.8
2014	Republika Srpska - Bosnia and Herzegovina	14	0.7
2015	Republika Srpska - Bosnia and Herzegovina	79	4.1
2017	Serbia*	26	1.3
2018	Serbia*	148	7.7
2019	Serbia*	5	0.3
2023	Serbia*	3	0.2

*Endemic/epidemic occurrence

Table 2. Number of measles cases in outbreak 2007 in Vojvodina

Age	No of cases	Percentage of cases	No of vaccinated cases	Percentage of vaccinated cases
0	10	5.0	0	-
1	3	1.5	0	-
2	6	3.0	0	-
3	5	2.5	1	20.0
4	7	3.5	0	-
5	5	2.5	0	-
6	6	3.0	0	-
7-9	13	6.5	1	7.7
10-14	41	20.5	13	31.7
15-19	30	15.0	6	20.0
≥20	74	37.0	7	9.5
Total	200	100.0	28	14.0

Table 2a. Incidence rate of measles cases by age in outbreak 2007 in Vojvodina

Age group	No of cases	Inc. per 100,000 inhabitants
0-4	31	**33.5**
5-9	24	**22.3**
10-14	41	**33.7**
15-19	30	21.8
≥20	74	4.7
Total	200	9.8

Table 3. Number of measles cases and incidence rate in outbreak 2014-2015 in Vojvodina

Age group	2014			2015		
	No of cases	Percentage of cases	Inc. per 100,000 inhabitants	No of cases	Percentage of cases	Inc. per 100,000 inhabitants
0-4	3	21.4	**3.4**	3	3.8	**3.4**
5-9	0	-	**-**	3	3.8	3.2
10-14	0	-	**-**	0	-	-
15-19	2	14.3	1.8	1	1.3	0.9
≥20	9	64.3	0.6	72	91.1	**4.7**
Total	14	100.0	0.7	79	100.0	4.1

Table 3a. Vaccination status of measles cases in outbreak 2014-2015 outbreak in Vojvodina

Age group	No of cases	No (%) of vaccinated with one dose of MCV*	No (%) of vaccinated with two doses of MCV*	No (%) of unvaccinated or unknown MCV* status
>1	4	0 (-)	0 (-)	4 (100.0)
1-6	3	3 (100.0)	0 (-)	0 (-)
7-14	2	1 (50.0)	0 (-)	1 (50.0)
≥15	84	9 (10.7)	6 (7.1)	69 (82.2)
Total	93	13 (14.0)	6 (6.4)	74 (79.6)

MCV: measles-containing vaccine

Table 4. Number of measles cases and incidence rate in outbreak 2017-2019 in Vojvodina

Age group	2017			2018			2019		
	No of cases	Percentage of cases	Inc. per 100,000 inhabitants	No of cases	Percentage of cases	Inc. per 100,000 inhabitants	No of cases	Percentage of cases	Inc. per 100,000 inhabitants
0	4	15.4	23.1	13	8.7	75.1	0	-	-
1	1	3.8	5.7	2	1.4	11.4	0	-	-
2	0	-	-	8	5.4	44.0	0	-	-
3	1	3.8	5.6	4	2.7	22.6	0	-	-
4	0	-	-	5	3.4	28.0	0	-	-
5	0	-	-	0	-	-	0	-	-
6	0	-	-	0	-	-	0	-	-
7-9	0	-	-	1	0.6	1.7	0	-	-
10-14	1	3.8	1.1	3	2.0	3.2	0	-	-
15-19	1	3.8	0.9	0	-	-	0	-	-
20-29	6	23.2	2.4	10	6.8	4.0	0	-	-
30-39	9	34.7	3.4	55	37.2	20.5	3	60.0	1.1
≥40	3	11.5	0.3	47	31.8	4.6	2	40.0	0.2
Total	26	100.0	1.3	148	100.0	7.7	5	100.0	0.3

Table 4a. Vaccination status of measles cases in outbreak 2017-2019 in Vojvodina

Age group	No of cases	No (%) of vaccinated with one dose of MCV*	No (%) of vaccinated with two doses of MCV*	No (%) of unvaccinated or unknown MCV* status
>1	17	0 (-)	0 (-)	17 (100.0)
1-4	21	15 (71.4)	3 (14.3)	3 (14.3)
5-9	1	0 (-)	1 (100.0)	0 (-)
10-19	5	0 (-)	3 (60.0)	2 (40.0)
20-29	16	8 (50.0)	6 (37.5)	2 (12.5)
30-39	67	49 (73.1)	0 (-)	18 (26.9)
≥40	52	26 (50.0)	0 (-)	26 (50.0)
Total	179	98 (54.7)	13 (7.3)	68 (38.0)

MCV: measles-containing vaccine

Table 5. Characteristics of measles cases in outbreak 2023 in Vojvodina

Address	Date of investigation	Gender	Date of birth	Reported by:	Number of MCV	Date of last MCV dose	Rash	Duration of rash (in days)	Initial location of the rash	Fever	Coryza	Cough	Conjunctivitis	Pneumonia	Hospitalized	Contact with suspected/confirmed case	Swab/swabs	Date of sample collection	Laboratory results
Novi Sad	1.2.2023.	M	20.01.2014.	The University Children's Clinic "Tiršova", Belgrade	0	-	Yes	2	Face, neck, chest	Yes	Yes	Yes	No	No	Yes	Yes (at the University Children's Clinic "Tiršova", Belgrade)	Nasopharyngeal	1.2.2023	RT-PCR* positive
Novi Sad	11.2.2023.	F	22.06.1984.	Institute for Child and Youth Health Care of Vojvodina, Novi Sad	1	2.7.1984	Yes	0	Face, neck, chest	Yes	No	Yes	Yes	No	Yes	Yes (at the Institute for Child and Youth Health Care of Vojvodina, Novi Sad)	Nasopharyngeal	1.2.2023	RT-PCR* positive
Novi Sad	27.4.2023.	F	5.2.1981.	Clinic for Infectious Diseases, University Clinical Center of Vojvodina	Unknown	-	Yes	6	Chest, stomach	Yes	No	Yes	No	No	No	Unknown	Nasopharyngeal, serum	26.4.2023	RT-PCR negative, ELISA IgM positive**

* Real-time polymerase chain reaction.

** In same time ELISA IgM positive for *Parvovirus B19*, *Coxsackie B* and *Echoviruses*.

4. TUBERCULOSIS PREVENTION AND CONTROL - TODAY'S CHALLENGES

Maja Stosic
Institite of Public Health of Serbia „Dr Milan Jovanovic Batut"

During the past years, the TB burden has been slowly decreasing at a rate of 1.5–2% per year due to many reasons: large TB infection pool, increasing risk factors for active disease, global ageing, slow and insufficient case detection, low cure rates, drug resistance and TB/HIV co-infection. In addition, TB is closely linked to the social-economic determinants. The main vulnerable people are those living in poor, crowded and poorly ventilated conditions; living with HIV, diabetes, malnurished, alcohol abusers, and drug and tobacco users, migrants, refugees, prisoners, ethnic minorities and marginalised populations. The higher the gross domestic product, the lower the TB incidence, the higher the level of undernutrition, the higher the incidence. Furthermore, major disruptive events like the pandemic and political conflicts greatly slow down the decline of TB burden.

All targets to end TB are off track, except people living with TB/HIV receiving TB preventive treatment. To get back and move towards further achievements, we need to accelerate development of new diagnostics, including new point-of-care tests for infection and disease, explore global digital health approaches, enhance artificial intelligence use, develop new drugs that are safer and easier to use, shorter treatment regimens, and effective pre- and post-exposure vaccines as well as transfer tools and technologies widelly to the most affected.

Key words: tuberculosis; challenges, prevention, control.

5. EFFECTIVENESS OF MODERN THERAPY IN THE TREATMENT OF CHRONIC HEPATITIS C

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Objectives: The modern therapeutic approach involves the use of direct acting antiviral drugs (DAA). The aim of the work is to demonstrate the effectiveness of the use of a new group of drugs with direct antiviral action in the treatment of chronic HCV infection.

Methods: The study included 91 patients with chronic HCV infection treated at the Clinic for Infectology of the UCC Niš between July 2022 and December 2023. Prior to initiation of therapy, the patients were subjected to biochemical blood tests, FIB4 score and Child-Pugh score, PCR, GENOTYPE, and abdominal ECHO. In the therapy, which lasted 8-24 weeks, the following were used: sofosbuvir / velpatasvir, elbasvir / grazoprevir, glecaprevir / pibrentasvir, and ribavirin.

Results: A control quantitative PCR was performed 12 weeks after the end of therapy and sustained virological response (SVR) was achieved in 90 patients. Of the 90 patients, 11 had cirrhosis, 14 were on a chronic dialysis program, and two had a kidney transplant. None of the patients had any adverse effects from the therapy. The patient who did not achieve SVR did not take the therapy regularly, therefore, the therapeutic effect can be considered to be 100%.

Conclusion: Application of DAA therapy resulted in SVR in all subjects without adverse effects of the therapy.

Key words: Hepatitis C, direct-acting antiviral drugs, therapy.

POSTER PRESENTATION:

1. DISTRIBUTION OF DOMINANT MICROORGANISMS FROM ISOLATES OF HUMAN MATERIAL AT THE UNIVERSITY CLINICAL CENTER OF NIŠ - EPIDEMIOLOGICAL SURVEILLANCE

Sonja Novak[1,2], Nikola Milenković[2], Nadežda Popović[2], Nataša Lukić[2], Bojan Stanojević[2], Zorica Petković[2]
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[2]University Clinical Center Niš, Department of Sanitary Epidemiological Surveillance

Introduction: The increase in the number of multiresistant strains of bacteria represents a serious threat to the healthcare system, both in the area of patient safety and in the area of increased treatment costs. The primary goal of the Epidemiology Department of the Niš University Clinical Center is effective prevention and control of hospital infections.

Objectives: The objective of this study was to determine the distribution of multiresistant strains of the most common bacterial isolates at all clinics of the Niš University Clinical Center in the period from January to December 2023 in order to create 'tailor-made' epidemiological surveillance of clinics.

Methods: A descriptive study was applied, and the data was obtained from the electronic records, i.e. the database of the Department for Sanitary Epidemiological Surveillance at University Clinical Center Niš, for the specified period of time. Data processing was performed using Microsoft Excel 2020.

Results: In the total sample of multiresistant isolates (3840), the most common bacteria isolated was *Klebsiella spp*. (19%), followed by *Acinetobacter spp*. (12.5%), *Pseudomonas spp*. (8.2%), *Staphylococcus aureus* (8.4%), *Escherichia coli* (7.2%), *Proteus mirabilis* (5.8%), *Enterococcus faecalis* (5.5%). The largest number of multiresistant bacteria was isolated at the Clinic for Anesthesia and Intensive Therapy (1663).

Conclusion: Based on the obtained results, a new approach was created in epidemiological surveillance with adjusted visiting dynamics, adjusted measures for the prevention and control of hospital acquired infections and defined thematic areas for education and training.

Key words: Hospital acquired infection, Infection control, Surveillance, Multidrug resistance, Teaching hospital.

2. EPIDEMICS IN SOCIAL WELFARE INSTITUTIONS ON THE TERRITORY OF NIŠAVA AND TOPLICA DISTRICT IN THE PERIOD 2014-2023 (OUR EXPERIENCES)

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[2]University of Niš, Faculty of Medicine Niš

Introduction: There are 12 social protection institutions on the territory of Nišava and Toplica districts, and they represent a great benefit for the third generation. At the same time, there is a risk of contracting infectious diseases and the occurrence of epidemics. The appearance of infectious diseases in an epidemic form in small home communities was a special challenge for everyone.

Material and Methods: A descriptive analysis was conducted. Data from the Niš of Public Health Institute Niš were used.

Results: In the observed period, 125 epidemics of infectious diseases were reported. Out of the total number of reported cases, there were 49 (39.2%), respiratory disease epidemics 39 (79.6%), intestinal infectious diseases 7 (14.2%) and 3 (8.1%) parasitic diseases. The number of exposed persons was 9870, 1996 (20.3%) became ill, 289 (2.9%) were hospitalized, and 134 (1.35%) died. The causative agent was proven in 89% of reported epidemics. In the period before the covid pandemic, 4 epidemics were registered in these institutions, while 45 epidemics (10 times more) were registered during and after the covid pandemic.

Conclusion: During and after the covid pandemic, the number of epidemics in social welfare institutions increased. The most common were epidemics of respiratory infectious diseases, so the promotion of vaccinations of users and employees in social welfare institutions is necessary. Primary health care facilities are not sufficient to meet the needs of users when it comes to protection against infectious diseases.

Key words: social protection institutions, epidemics of infectious diseases.

3. EPIDEMIOLOGY OF LEGIONELLOSIS IN SLOVENIA BETWEEN 2017 AND 2023

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National Institute of Public Health, Slovenia

Objectives: The aim of the article is to present the epidemiological characteristics of legionellosis cases in Slovenia between 2017 and 2023.

Methods: Based on the reported cases, we estimated the incidence of legionellosis in Slovenia between 2017 and 2023. The data included gender, age group, month of case notification, source of infection, and the number of hospitalized and deceased patients.

Results: In Slovenia, a total of 993 cases of legionellosis were reported between 2017 and 2023 (68.1% men, 31.9% women). Most patients (77.2%) were treated in the hospital. In the majority of cases (75.6%), there was no information about living in a higher-risk environment (patients lived at home). Most reported cases (47.8%) occurred from June to September. The number of deaths has remained low and stable throughout these years.

Conclusion: A retrospective analysis revealed an increasing trend in reported legionellosis cases in 2022 and 2023, likely due to various factors such as the relaxation of pandemic measures, increased travel, an aging population with more comorbidities, and enhanced diagnostics. The risk of Legionella infection can be reduced by following preventive measures, so proper public information is important.

Key words: legionellosis, reported cases, epidemiology.

4. LEGIONELLOSIS FROM 2015 TO 2019 IN THE CELJE REGIONAL UNIT

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National Institute of Public Health, Slovenia

Objectives: To determine the epidemiological characteristics of laboratory confirmed legionellosis cases in the Celje regional unit.

Methods: Using a retrogressive descriptive epidemiological method, we examined the epidemiological surveys for reported legionellosis cases from 1 January 2015 to 31 December 2019 from the Celje regional unit.

Results: Of the 119 reported cases, epidemiological investigations were conducted on 116 of them. The majority of cases were male. The mean age was 59.2 years. The presence of associated risk factors was identified in 77 % of patients. The vast majority of patients were hospitalized. The median time from onset of illness to diagnosis was five days. In the majority of cases, a urine sample was obtained. In 40 % of cases, the home environment was identified as the potential source of infection, with thermal complexes, hotels, workplaces, healthcare facilities and social welfare institutions also implicated. Of the water samples obtained from the domestic environment, 85.5 % were positive, while 86.4 % of those taken from public facilities yielded positive results.

Conclusion: We are aware that the number of reported legionellosis cases does not necessarily reflect the actual number within the community. It is imperative that healthcare professionals continue to be educated about Legionella infections.

Key words: Legionellosis, epidemiology, Celje Regional Unit.

5. IMPLEMENTING OF POST-EXPOSURE RABIES PROPHYLAXIS: EXPERIENCES FROM THE ANTI-RABIES STATION AT THE INSTITUTE OF PUBLIC HEALTH NIŠ

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[2]University of Niš, Faculty of Medicine Niš

Introduction: The last case of human rabies in Serbia was recorded in 1980 in the territory of the Republic of Kosovo. The aim of the paper was to present the challenges in rabies prevention implementation and experiences from the Anti-Rabies Station at the Public Health Institute Niš (IPH).

Material and Methods: A descriptive study was conducted based on data from the Anti-rabies Station of IPH Niš. The observed period was from January 1, 2012, to May 23, 2024.

Results: A total of 9,525 individuals were examined, ranging from 502 (5.27%) in 2012 to 951 (9.98%) in 2023. In 2012, 33.07% of injured persons received post-exposure rabies prophylaxis, whereas in 2023, this percentage dropped to 6.83%, representing a 4.8-fold decrease. Slightly more men (54.93%) were injured compared to women (45.07%), and younger individuals, aged 16-30, were more frequently affected than those aged 46-60. Most of the injuries were caused by dogs 90.85%, while 7.15% were from cats.

Conclusion: In recent years, the number of people bitten by animals has significantly increased, but the number of vaccinated individuals has decreased considerably. Conflicting recommendations, inconsistent practices, and shortages of human rabies serum or vaccines are some of the reasons for this trend.

Key words: rabies prevention, challenges, experiences.

6. Q-FEVER IS NOT FORGOTTEN DISEASE: THE IMPORTANCE OF PREVENTION, DIAGNOSIS AND TREATMENT

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Introduction: Q-fever is world-wide distributed zoonosis caused by highly infective resilient bacterium *Coxiella burnetii*. It could be transmitted through animal products, ticks, dust particles, aerosol droplets and considered as bioweapon. The animal disease is often asymptomatic, although it could provoke abortions and stillbirths. Acute human flu-like disease often resulting in atypical pneumonia, while the chronic forms could provoke fatal endocarditis.

Objective: Serological *C. burneti* confirmation in post-COVID patients with cardiological manifestations, chronic fatigue symptoms and autonomous nervous system disfunctions.

Methods: ELISA detection in 173 patients sera.

Results: Specific antibodies were found in 76 patients (43.93%), among them 20 (26.36%) had only IgG1 antibodies, indicating possible chronicity. The other patients had IgM2, IgG2 and/or IgG1 antibodies, markers of acute illness, while 97 (56.07%), were seronegative. The zoonotic intracellular bacteria (*B. burgdorferi, B. henselae, Brucella spp*), which can also cause possible cardiological and pulmonary diseases, were not serologically detected. Frequent *C.burnetii* appearance in post-COVID era could be explained by immunossupression after high-corticosteroide treatment or exhausation of immune system with cytokine storm or prolonged inflamattion/infection.

Conclusion: Q-fever is not forgotten disease, so the special atention must be paid to its prevention, improvement of detection in field and laboratory conditions, clinical treatment and procurement.

Key words: Q-fever; Coxiella burnetii; COVID-19; serology, prevention.

7. MEASLES, THE RETURN OF A VACCINE-PREVENTABLE DISEASE

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Introduction: Although a safe and effective vaccine has been available for more than 6 decades, global reluctance to vaccinate has led to insufficient vaccination. Before the Covid-19 pandemic, vaccination coverage in Novi Pazar was satisfactory, but after the pandemic it dropped drastically. Because of this, measles vaccination control has been threatened by an alarming increase in measles cases in recent months.

Objectives: The research is to monitor the measles epidemic in Novi Pazar.

Methods: Our study was conducted as retrospective study in the General Hospital Novi Pazar and Public Health Institute Novi Pazar from May to August 2024. Data were obtained from hospital records.

Results: Since the beginning of the epidemic, 123 cases of suspected measles have been reported. The criteria for measels diagnosis were based on the clinical picture and epidemiolocical association. In fact suspected patients aged 0-41 years, were unvaccinated with MMR vaccine. Out of the total number, 81 cases have been confirmed in the reference laboratory Torlak and 6 cases were negative.

Conclusion: Given that there is a re-emergence of measles in countries where the control of this disease was successful in past, partly due to lack of information, partly due to the anti-vaccination movement, it is very important that, first of all, general practitioners continuously educate their patients. Then, the pressure of community and government programs in this sense could increase the number of vaccinated people, given that vaccination is the most successful way to control measles.

Key words: epidemic; measles; outbreak; public health; vaccination.

8. MEASLES VACCINATION COVERAGE OF CHILDREN IN THEIR SECOND YEAR OF LIFE IN THE NIŠAVA DISTRICT

Marko Jovanović, Zorana Deljanin
Public Health Institute Niš

Introduction: During the period from 2020 to 2022, in the WHO European Region, the coverage of the first dose of the MMR vaccine dropped from 96% to 93%. In Serbia, the lowest MMR vaccination coverage in the last 20 years was recorded in 2020 and 2021. The coverage of this vaccine for children in their second year of life was 78.1% in 2020 and 74.8% in 2021. The aim of this study was to present the MMR vaccination coverage of children in their second year of life during the period from 2021 to 2023.

Material and Methods: A descriptive study was conducted. The source of data was the Immunization Department of the Public Health Institute Niš.

Results: In 2021, the vaccination coverage in the Nišava district was 79.09%, in 2022 it dropped to 69.9%, and in 2023 it increased to 83.27%. In the city of Niš, the coverage ranged from 76.7% to 81.49%. The lowest coverage was recorded in the municipality of Gadžin Han, with 50%. The highest coverage was in the municipality of Aleksinac, reaching 97.3% in 2021 and 100% in 2023, as well as in Gadžin Han and Doljevac. In the first six months of 2024, the coverage in the Nišava district was 41%, while in the city of Niš it was 37%.

Conclusion: Continuous education of parents about measles and the promotion of vaccination are essential.

Key words: measles, vaccination coverage.

9. PERTUSSIS (WHOOPING COUGH) IN THE CELJE REGION DURING THE PERIOD BETWEEN JANUARY 2024 AND JUNE 2024 - REVIEW OF THE CASES

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Objectives: To determine the epidemiological characteristics of laboratory confirmed pertussis cases in the Celje region.

Methods: Using a retrogressive descriptive epidemiological method, we examined the epidemiological surveys for reported pertussis cases from 1 January 2024 to 30 June 2024 from the Celje region.

Results: Among the 85 reported cases, the majority were children aged between 5–14 years. Most of the reported cases were vaccinated. On average, people who were vaccinated became ill four years after receiving the last dose of vaccine. Overall, chemoprophylaxis was required for two people per case of whooping cough infection where close contacts were identified. On average, two close contacts of reported cases had previously shown symptoms of whooping cough.

Conclusion: In 2024, Slovenia is facing with pertussis outbreak in all regions. We are aware that the number of reported pertussis cases does not reflect the actual number of cases. The most effective way to prevent whooping cough is to maintain a high vaccination coverage. Pregnant women can help protect their babies by getting vaccinated soon after 24. week of pregnancy.

Key words: whooping cough (pertussis), Bordetella pertussis, Celje region.

10. TUBERCULOSIS OUTBREAK IN A SOCIAL INSTITUTION

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Introduction: Tuberculosis has been a significant global public health problem since the mid-1980s. The objective of the paper was to present the tuberculosis outbreak in a social institution for the accommodation of individuals with severe physical and mental disabilities.

M**atherial and Methods:** An epidemiological outbreak investigation was conducted, followed by the implementation of control measures. The investigation included interviews with employees, checking the vaccination records of residents, identifying contact persons, and conducting health screenings of contacts.

Results: The first case was diagnosed on January 26, 2023. A total number of five residents were affected, and one person passed away. None of the affected individuals were vaccinated. There were 115 residents and employees, with 17 individuals being in close contact with the cases. During the 1.5 years of follow-up, no additional cases emerged. 23 residentswere on chemotherapy prophylaxis and regular follow-up with a pulmonologist.

Conclusion: Newly admitted residents who are non-vaccinated or without data about BCG vaccination, as well as those in whom the infection was not recognized in a timely manner, are at the highest risk.

Key words: tuberculosis, outbreak, control measures, social institutions.

11. EPIDEMIOLOGICAL CHARACTERISTICS OF SALMONELLOSIS IN THE POPULATION OF NISAVA DISTRCT FOR THE PERIOD 2014-2023

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The aim of this paper is to determine the epidemiological salmonella characteristics in patients on the territory of Nisava District.

Material and methods: The material used were illness-death records of infectious diseases, epidemic out-report and annual reports of the Center for Disease Control and Prevention IPH Nis. The period from 2014 to 2023 was observed.

Results: The method of descriptive statistics showed that in the observed period 664 cases of salmonella were registered. The average annual rate of illness was 18,59 per 100,000 inhabitants. In 2017 for 21.84% of all cases were recorded. The incidence shows a decreasing trend.The highest percentage of patients (80.87%) and the highest rate of disease has the Municipalities Nis, 21,52 per 100,000 inhabitants. Female infected persons were more present (55.42%) than males (44.58%). In both sexes, the highest average age-specific rates were found in age group 0-4, and the lowest for people age 70 and older. The average crude salmonellosis incidence rate (per 100,000) was 18.59 (16.94 for men and 20.17 for women). The largest number of cases – 11.75% was recorded in August. The most frequent Salmonella were S. enteritidis (58.28%), S. spp (28.92%) and S. gr B (5.27%). S. enteritidis was reported seven times in epidemic form.

Conclusion: The reduced number of registered salmonellosis cases in recent years can be explained by not distinguishing diarrhea from the symptoms of Covid 19, as well as the fear of patients with these complaints to see a doctor during the corona pandemic

Key words: salmonellosis, incidence, trend, epidemic, salmonella serotypes.

12. EPIDEMIOLOGICAL CHARACTERISTICS OF ACUTE HEPATITIS B IN THE NIŠAVA DISTRICT

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[3]Public Health Institute Vranje

Objectives: To assess epidemiological characteristics, incidence and trend of acute hepatitis B in the Nišava District in the period 2011-2020.

Materials and methods: Descriptive epidemiological method was applied. Data for the study analyses were provided by Annual Reports of Communicable Diseases of the Institute of Public Health Niš. Incidence rates (IR) were calculated per 100,000 inhabitants.

Results: A total of 126 new acute HBV cases were registered (67% males and 33.3% females). The male-to-female ratio was 2:1. The average annual IR was 3.21 (in males was 4.36 and in females was 2.10). The highest IR was registered in 2012 (5.35), while the lowest rate was reported in 2020 (0.25). Incidence trends have decreased in both sexes. The highest IR were registered for ages 30-39 (56.17) and 20–29 years (55.22), whereas the lowest found in the age group 0-9 years (0.00). The highest IR were reported in the municipalities of Niš (3.69) and Aleksinac (3.66) and the lowest rates were registered in the municipalities of Gadžin Han (0.0) and Ražanj (0.0). Data on transmission were incomplete.

Conclusion: The rate of acute cases and IR continued to decline over the last ten years, which is in accordance with global and Serbia trends and most likely reflects the impact of national vaccination programmes. There is a need to improve quality of reporting and surveillance data in monitoring the epidemiological situation of the acute hepatitis B.

Key words: epidemiological characteristics, acute hepatitis B, incidence.

13. EPIDEMIOLOGICAL CHARACTERISTICS OF CHRONIC HEPATITIS B IN THE NIŠAVA DISTRICT

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Objectives: To assess epidemiological characteristics, incidence and trend of chronic hepatitis B in the Nišava District in the period 2011-2020.

Materials and methods: Descriptive epidemiological method was applied. Data for the study analyses were provided by Annual Reports of Communicable Diseases of the Institute of Public Health Niš. Incidence rates (IR) were calculated per 100,000 inhabitants.

Results: A total of 92 chronic HBV cases were registered (73% males and 27% females). The male-to-female ratio was 2.7:1. The average annual IR was 2.35 (in males was 3.48 and in females was 1.25). The highest IR was registered in 2013 (4.84), while the lowest rate was reported in 2020 (0.25). Incidence trends have decreased in both sexes. The highest IR were registered for ages 40-49 (39.0), 30–39 years (37.45) and 50–59 years (36.03), whereas the lowest found in the age group 5-14 years (0.00). The highest IR were reported in the municipalities of Niš (2.69) and Aleksinac (2.31) and the lowest rates were registered in the municipalities of Svrljig (0.7) and Ražanj (1.09). Data on transmission were incomplete.

Conclusion: The rate of chronic cases and IR continued to decline over the last ten years, which is in accordance with global and Serbia trends. Key interventions include hepatitis B childhood vaccination, injection safety, increased testing with linkage to care and treatment and improving the quality of the reported data.

Key words: epidemiological characteristics, chronic hepatitis B, incidence.

14. EFFECTIVENESS VACCINATION IN PREVENTING COVID-19 SIX MONTHS AND MORE AFTER 2 DOSE, AND UP TO FIVE MONTHS AFTER RECEIVING THIRD DOSE IN THE MUNICIPALITY OF VOŽDOVAC, BELGRADE: A COMMUNITY STUDY COMPARING FOUR VACCINES

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Introduction: Availability of vaccines less than a year after the start of the COVID-19 pandemic, following with a largest vaccination campaign in history, critically altered the pandemic course globally. Data on Covid-19 vaccine efectiveness (VE) are necessary for vaccine recommendations and policies, better vaccine acceptance, especially among populations vulnerable to severe SARS-CoV-2 infections.

Method and data: To assess the risk of COVID-19 in the vaccinated, as compared to the unvaccinated population, as well as the comparative effectiveness of the BBIBP-CorV, BNT162b2, Gam-COVID-Vac and ChAdOx1 vaccines in the prevention of clinical infection,we conducted during a 5-month period a retrospective cross-sectional study of the incidence SARS-CoV-2 infection and clinical COVID-19 in both vaccinated and unvaccinated individuals in the Belgrade city municipality of Voždovac between November 1. 2021. and March 31. 2022. at the time of the transmission of theSARS-CoV-2Delta and Omicron variant.For the analysisby vaccine type,individuals whose COVID-19 diagnosis was confirmed by a positive PCR test were interviewed by telephone on their vaccination status. Only those who received two or three doses were included in the study.

Results: The results showed that Voždovac population of 169,567, a total of 88,870 (52,4%) individuals were vaccinated with two or three doses by the end of the study. Two doses BBIBP-CorV vaccine received 28.8% related to the total population,while14,9%received the BNT162b2 vaccine, 5,8% the Gam-COVID-Vac and 2,7% the ChAdOx1 vaccine.Those vaccinated with third dose related to the total population received the BBIBP-CorV vaccine(13,9%),while14,9%received the BNT162b2 vaccine, 3,1% the Gam-COVID-Vac and 0,4% the ChAdOx1 vaccine. Importantly, none of the individuals vaccinated with any of the vaccines exhibited registered side effects other than immediate and transient reactogenicity, and no adverse reactions that would require medical assistance were reported to the relevant national authority (Medicines and Medical Devices Agency ofSerbia). The overall risk of infection in thevaccinated who did not receive the third dose vs.the unvaccinated population, RR was 0.93 (95% CI 0.88–0.99), while the overall VE was 7% . Analyzed according to age group,the relativerisk for those vaccinated with two doses was statistically significant only for older than 75 (0.45 CI 0,34-061) resulting in a VE of 55%. Those vaccinated with three doses had an overall RR vs. unvaccinated 0.65 (CI 0.61-0.69), with a VE of 35%. Analyzed according to age group,th erelative risk decreased from 0.71 in the18–49 group,to 0.69 in the 50–64 group and 0.46 in those above 75, resulting in a VE of 29%, 31% and 54% in the youngest, middle and oldest age groups, respectively (the group of under age 18 was not taken into account for these analyses due to the small lnumbers). Comparing those vaccinated with three doses versus those with two doses, the RR was 0.69 (95% 0.64-0.75) with a VE of 31%.

A statistically significant difference in the risk of the disease was found in the age of 18-49 (RR 0.72 95% CI 065-0.79) with VE 28% and in the age of 50-64 RR 0.76 95% CI 0.64- 091,

with VE 24%. The greatest effectiveness was exhibited by BNT162b2, followed by Gam-COVID-Vac, BBIBP-CorV vaccines. Results for ChAdOx1 nCoV-19 is statistically insignificant due to the small number of those vaccinated with the third dose of this vaccine.

Conclusion: Taken together, these real-world data attest to a modest overall effectiveness of three-dose COVID-19 vaccination against symptomatic infection in the observed population after a time period, as well as a considerable effectiveness of both three- and two-dose regime in reducing the risk of symptomatic infection among the elderly.

Key words: Effectiveness Vaccination, Preventing COVID-19.

15. ANALYSIS OF THE MORTALITY RATE AND EXCESS MORTALITY IN BELGRADE FROM MARCH 2020 TO MAY 2023.

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Introduction: Death rate and excess mortality in the population are the most significant indicators of the impact of health disorders on public health. The purpose of this paper is to analyze mortality rates and excess mortality for Belgrade in the period from March 2020 to May 2023. and present the impact of the SARS-CoV-2 infection pandemic on the general mortality rate in the Republic of Serbia.

Method and data: A descriptive epidemiological method was used. For morbidity data, the Republic Institute for Public Health of Serbia was the source, and for data on deaths, data from the Republic Institute for Informatics and Statistics were used. Rates and linear regression analysis were used in the statistical analysis. The research period is from March 2020. until May 2023. Data from 1995 were used to model the expected mortality rate. The method used in SPSS for modeling the expected mortality rate is Exponential Smoothing, Simple seasonal type. Excess mortality is shown by the percentage increase in the mortality rate (p-Excess Mt) compared to the expected one, by month in the period from March 2020 to May 2023. p-Excess Mt = mortality rate - expected mortality rate/ expected mortality rate

Results: In the observed period, the lowest value of the mortality rate was recorded in June 2022, 93.75 per 100,000 inhabitants (number of deaths 1579), and the highest value was recorded in December 2020. 217.65 per 100,000 inhabitants (number of deaths 3688). In the period from March 2020 to May 2023. the lowest value of p-Excess Mt was recorded in June??? Mislim da je May 2022 (-7.25), and the highest value in December 2020 (89.96). In the period from March 2020 to July 2022, a total of 2,029,400 cases of SARS-CoV-2 infection were registered in the Republic of Serbia, while the number of deaths from all causes was 293,373. The highest number of SARS-CoV-2 infections was registered in January 2022 and amounted to 378,459. The highest number of deaths was 17,321 in December 2020. Through linear regression, it was established that the rate of SARS-CoV-2 infection per 100,000 inhabitants is a statistically significant predictor of general mortality per 100,000 inhabitants ($F=18.75$; $p<0.001$), which explains 41.9% of the variability in mortality.

The regression formula reads: $⟦Mt⟧\_(per\ 100{,}000)=135.37+0.018*I\_(SARS\text{-}CoV\text{-}2\ per\ 100{,}000)$ The regression coefficient of 0.018 indicates that for approximately every 55 cases ofSARS-CoV-2 infection per 100,000 population in one month, one more death per 100,000 population is expected in the same month.

Conclusion: The study explores the impact of COVID-19 on mortality rates in Serbia and analyzes the correlation between the pandemic and the overall lincrease in mortality rates. Through linear regression, it was established that the rate of SARS-CoV-2 infection per100,000 inhabitants is a statistically significant predictor of general mortality per100,000 inhabitants ($F=18.75$; $p<0.001$), which explains 41.9% of the variability in mortality Future research directions for the COVID-19 pandemic are crucial in order to better understandthe virus, develop effective prevention and treatment strategies, and prepare for potential future outbreaks.

Key words: the mortality rate, excess mortality.

APPLICATION OF MACHINE LEARNING IN PREDICTING THE IMPACT OF AIR POLLUTION ON BACTERIAL FLORA

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Air pollution is recognized by WHO as a cause for 7.6% of global mortality. Ambient air pollution as well as household pollution in the cities rises as global worldwide problem. Aim of the study: The possibility of gaining new knowledge, through decision tree models, of the relationship between the conditions that favors the growth of the bacterial flora related to air pollution factors, like PM2.5 and PM10. Material and methods: predictive cluster trees in CLUS system were obtained with relevant microbiological data form indoor air samples and two locations for outdoor and one indoor samples for PM readings as well as O2, NO2, SO2 and CO. These measurements were performed by two apparatus: BAM-1020 Met One instruments Inc. and Aerocet 831 MetOne Instruments, Inc. Results and conclusion: The results from all the models clearly indicated that the winter season has the greatest influence on the bacterial growth, compared with the summer measured data. In the summer months there is no visible difference between the total air pollution outside the indoor air, but in the summer month's microorganisms are more often present indicators of the presence of dust and fecal contamination. Air pollution with PM particles proportionally affects the microbiological contamination of indoor air. The reduction of air pollution is proportionally followed by a reduction of microbiological air contamination in both seasons and in both measured air samples. There is no visible association of microbiological contamination with the origin of increased air pollution, i.e. outside / indoor air.

Keywords: Decision Trees, Air Pollution, Bacterial Flora, Particle Matter pollution.

IMPORTANCE OF ENTEROHEMORRHAGIC E. COLI (EHEC)

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In 1886, microbiologist and pediatrician Theodor Escherich published his paper on Bacterium coli commune and described its physiological role. Later, bacterium changed its name to *Escherichia coli*. *E. coli* is a group of harmless bacteria with an extreme potential to changing. There are several *E. coli* clones that have acquired virulence factors: enterohaemorrhagic *E. coli* (EHEC), enteropathogenic *E. coli* (EPEC); enterotoxigenic *E. coli* (ETEC), enteroaggregative *E. coli* (EAEC), enteroinvasive *E. coli* (EIEC), diffusely adherent *E. c*oli (DAEC). EHEC was recognized as the result of two epidemics observation. EHEC strains produce verotoxin (VT), give attaching and effacing lesions, produce hemolysin, possess plasmid of 60 Mda and belong to some characteristic serogroups. In addition, it possesses a type III secretion system (T3SS) and the type VI secretion system (T6SS) which is involved in the bacterial pathogenicity and bacteria-bacteria competition. Flagellum-dependent motility plays diverse roles in the pathogenesis of EHEC O157:H7: migration to an optimal host site, adherence, survival, and post-infection spreading. EHEC is a human pathogen that colonizes the colon and causes outbreaks of bloody diarrhea and hemolytic uremic syndrome (HUS). Most genes required for AE lesion formation are grouped within a pathogenicity island (PAI), on the locus of enterocyte effacement (LEE), which encodes a T3SS that injects effector proteins into the host cell. Consequence of their injection is cytoskeleton rearrangement and effacement of the intestinal microvilli. Also, EHEC can produce mucin-degrading enzymes, which contributes to bacterial penetration of the mucus layer. EHEC possess very low infective dose, which is one of the paramount mechanisms evolved by this pathogen to expand in the gut. New studies have point that EHEC can take advantage of the resident gut commensals by using microbiota-derived molecules. There are over 380 distinct EHEC serotypes of but only EHEC of serotypes O157:H7, O26:H11, O45:H2, O103:H2, O111:H8, O121:H19 and O145:H28 are the most frequently associated with human disease. EHEC O80:H2 is emerging in France. It can induce hemolytic uremic syndrome with bacteremia. However, azithromycin might treat these infections.

Key words: EHEC, virulence, serotypes

PLATELETS, PLATELET INDICES AND TROMBOGENIC RISK ASSESSMENT IN THE CONTEXT OF THE EFFECT OF LOW-GRADE CHRONIC INFLAMMATORY STATE- CAN WE BE BETTER?

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Objectives: A previous opinion that platelets are blood elements important only in the coagulation process has been overcome and today it is believed that platelets have significant functions in enhancing the process of inflammation. Low-grade chronic inflammation, caused by long-term excessive calories intake, can be found in obesity-related diseases (such as metabolic syndrome and type 2 diabetes).

Methods: A retrospective cross-sectional study, conducted at the University Clinical Center Kragujevac, enrolled 113 ambulatory subjects, 63 patients with the diagnosis of metabolic X syndrome, and 50 healthy controls. The study was conducted following the Declaration of Helsinki, and approved by the Ethics Committee of the University Clinical Center Kragujevac. The diagnosis of metabolic syndrome was confirmed according to the International Diabetes Federation consensus definition.

Results: Our results clearly show that monitoring platelet counts and platelet indices could be very useful in patients with obesity-related diseases, given the effects that metabolic disorders and low-grade chronic inflammation have on platelets.

Conclusion: Routine determining the count and platelet indices could indicate patients with an increased risk of thrombosis, but also a group of patients where the future application of anticoagulant therapy (or some new experimental medication) could prevent the development of thrombosis.

Keywords: metabolic syndrome, platelets, platelet indices, thrombosis prevention.

Poster presentation

DETECTION OF THE BORDETELLA PERTUSSIS BACTERIA BY REAL TIME PCR METHOD IN THE PERIOD FROM OCTOBER 2023 TO FEBRUARY 2024

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Objectives: The end of 2023 and the beginning of 2024 were marked by an increase in the infection with *Bordetella pertussis*. In order to create collective immunity, it's necessary that the percentage of vaccinated people is greater than 95%. The percentage of immunized is lower in the last few years. The aim of this study is to emphasize the importance of real time PCR tests in the diagnosis of whooping cough and analysis of the results during the observed period.

Material and methods: 2101 nasopharyngeal swabs were analyzed by RT PCR with different kits.

Results: By analyzing 2101 samples, it was observed that the highest percentage of positive cases was recorded in October 2023, when 47.7% of those tested were positive. In the following months, the percentage of positive samples gradually decreased, while the percentages of positivity, for the period November 2023 - February 2024, were respectively: 31.2%, 29%, 23.9% and 16.9%.

Conclusion: Infections of rare respiratory pathogens occasionally appear. The real time PCR method is important for the detection of such pathogens due to its high sensitivity. This method enables efficient and reliable diagnostics with a high degree of specificity for the analyzed bacteria.

Key words: Bordetella pertussis, Real time PCR, Whooping cough

DOMINANT HPV TYPES FROM CERVICAL SAMPLES DETECTED BY PCR TESTING IN THE PERIOD 2022-2023. IN THE NORTH BANAT REGION

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Objectives: The aim of this study was to determine the presence and age distribution of different oncogenic Human papilloma virus (HPV) types in women in the North Banat region.

Materials and methods: In a group of 221 women with abnormal cytology, the commercial HPV Real-TM PCR kit (Sacace Biotechnologies, Italy) was used for detection of 14 different high risk HPV genotypes in cervical swabs.

Results: Among the 221 tested women, 43% were HPV positive. The highest percentage (55%) of positive results was in women in the reproductive period of 20-29 years. Multiple HPV infections were most common in women ages 20-29 and 40-49, and the highest percentage of infection with one genotype were in the age of 15-19 and 50-59 years. The most prevalent HPV types found were 16, 31, 18, 51 and 68, which is the same prevalence of these genotypes in Serbia and the region.

Conclusion: Genotypes 16,18, 31 are included in the 9-valent prophylactic vaccine Gardasil 9. The Gardasil 9 vaccine is on the list B RFZO from 2022. The results provide new data on the circulation of oncogenic HPV genotypes and frequency of multiple infections among women in North Banat region.

Key words: Human papilloma virus, real-time PCR, North Banat region.

DETECTION OF HIGH-RISK HPV GENOTYPES 16 AND 18 BY RT-PCR METHOD IN THE PERIOD FROM OCTOBER 2022 TO OCTOBER 2023

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Objectives: High-risk HPV genotypes are also classified as carcinogens. Given the large number of new and fatal cases of cervical cancer each year, prevention measures and screening tests are essential. Therefore, the aim of the paper is to highlight the role and importance of the RT-PCR method in the diagnosis of high-risk HPV genotypes, as well as the consequences of infection with this virus.

Materials and Methods: 2154 cervical and urethral swabs have been analyzed. The molecular method used for detection has been Real-Time PCR and the diagnostic test Viasure CerTest Biotec.

Results: Of the 2154 samples tested, 715 (33%) gave a positive result for one of the 14 high-risk HPV genotypes. HPV genotype 16 was detected in 191 (21%) patients, which makes it one of the most frequently detected HPV genotypes. HPV genotype 18 was detected much less often, in 65 patients (8%).

Conclusion: HPV represents one of the most significant targets in molecular diagnostics, because of its direct connection with the development of cancer. The RT-PCR method is extremely effective in the diagnostics of HPV due to the speed of analysis and the sensitivity of the tests.

Key words: High-risk HPV, Cancer, Real-Time PCR, HPV genotypes 16 and 18, molecular diagnostics

LYME DISEASE, LABORATORY DIAGNOSIS USING THE WB IgM AND IgG METHOD IN THE PERIOD FROM 01.06.2020 - 01.07.2024.

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Objectives: Lyme disease is present in the population and is transmitted through ticks, which are also a source of infection for humans at any stage of development. Within the tick population, there is also vertical transmission, which means that infected ticks transmit pathogens to their offspring.

Materials and Methods: The work relies on the Makrogen test for the analysis of WB IgM and IgG, which was used to obtain the results of the analyzes and the analyzes were performed from the serum of patients who requested these analyses. **Results:** In the mentioned period, 425 IgM samples were tested, of which 146 samples (34.35%) were positive and IgG samples were 266 and 64 were positive (24%).In the work itself, we dealt only with positive samples and specific bands that are significant for a positive result, namely bands for both OSPC, p41, VLSE, p100, p39, p18, p58 antibodies. It is not possible to show the overall distribution in the abstract, but the distribution and frequency of antigen bands are listed by year and by template.

Conclusion: Considering the corona virus pandemic and the closures, the data on positive blots are significant because they also reveal people's movements. Lyme itself is important because the number of positive samples and the number of samples in general have increased over time. The obtained distribution of antigen bands could help the clinician to decide on the therapy according to the antigens present, especially for the IgM analysis.

Key words: lyme , WB IgM , WB IgG , Positive results

MICROBIOME, PROBIOTICS AND PREBIOTICS

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Objectives: The human digestive system consists of about 100 trillion microbes, primarily of bacterial origin, which provide a wide range of metabolic functions to the host. Data obtained from animal model studies and clinical studies suggest that antibiotics cause long-term changes in the composition of the gut microbiota.

Methods: For maintaining the balance of the gut microbiome, it is essential to use probiotics and prebiotics correctly. Some probiotics are used exclusively for gut microbiota imbalance caused by antibiotics. On the other hand, the combination of foods is crucial to maintaining the balance of the gut microbiome.

Results: When individuals undergo just a ten-day challenge to maintain a healthy gut microbiome, results are already visible. It is important to note that this is solely about maintenance and not about addressing an imbalance in the gut microbiota.

Conclusion: There is significant evidence supporting the hypothesis that the endogenous gut microbiota plays a key role in the pathogenesis of many diseases. Lifestyle changes may have altered the initial development or stable maintenance of the microbiota, thus affecting the "normal" or healthy composition of the microbiota, leading to dysbiosis.

Keywords: gut microbiome, probiotics, prebiotics

DETECTION AND AGE DISTRIBUTION OF CHLAMYDIA TRACHOMATIS GENITAL INFECTIONS BY REAL TIME PCR METHOD

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Objective: Chlamydia trachomatis is the most common cause of non-gonoccocal urethritis in men and cervicitis in women. The aim of this research is to determine the frequency of chlamydial infection and distrubution among different age groups.

Materials and methods: The research was conducted in the Center for Microbiology of the Institute of Public Health Niš, in the period from April 2023 to July 2024. Urethral swabs of 601 men and endocervical swabs of 3092 women, were analyzed by Chlamydia Trachomatis DNA Fluorescence Diagnostic Kit by Sansure Biotech.

Results: Among 3693 tested, 1,5% were positive for chlamydial genital infection. In the group of positive cases, 50,9% were among <25 age group, 34,5% among 25-34 years age group, 9,1% in the age group 35-44, 3,6% in age group 45-54 and 1,8% in >55 years old. Considering a small sample size statistically no significant findings were determined between sex and PCR results (Chi=2.221, p=0.136) and between age groups and sex among PCR positive cases (Fisher=3.219, p=0.521).

Conclusion: More than half of the positive PCR cases are within <25 age group, which is expected, considering risk factors for chlamydial genital infection.

Key word: *Chlamydia trachomatis*, sex, age groups.

FREQUENCY OF HPV GENOTYPES IN THE TERRITORY OF SREM DISTRICT

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Objectives: Cervical cancer is almost entirely caused by the human papillomavirus (HPV). Through this analysis, we wanted to look at the frequency of HPV genotypes in the territory of the Srem district.

Materials and methods: Virus detection was done by PCR method from cervical canal swab cells. In the period from January 1, 2024 to July 30, 2024, 600 women between the ages of 20 and 61 were tested. Manual extraction of nucleic acids was performed using the RealBest DNA-express KIT. We used the RealBest DNA HPV HR genotype KIT for detection (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59).

Results: Out of the total number of tested women, 180 were positive (30%). Type 16 – 55(30,5%), Type 18 – 12(6,6%), Type 31 – 28(15,5%), Type 33 – 27(15%), Type 35 – 27(15%), Type 39 – 20(11,1%), Type 45 – 13(7,2%), Type 51 – 19(10,5%), Type 52 – 20(11,1%), Type 56 – 20(11,1%), Type 58 – 13(7,2%), Type 59 – 9 (5%). Of the total number of tested women, 72.7% were infected with one type and 27.3% with more than one.

Conclusion: Knowing the frequency of genotypes is important in the prevention of infection. Cervical cancer is a highly preventable disease.

Key words: HPV genotyping, PCR, Srem district

THE ASSESSMENT OF DISABILITY-ADJUSTED LIFE-YEARS (DALYS) ASSOCIATED WITH 85 PATHOGENS, PATHOGEN GROUPS AND INFECTIOUS DISEASES GLOBALLY AND IN SOUTH EASTERN EUROPE

Tomislav Meštrović, on behalf of the IHME/Oxford GRAM Team

A comprehensive assessment of the disability-adjusted life-years (DALYs) associated with 85 different pathogens, pathogen groups and infectious diseases was recently conducted, with the aim to understand the magnitude of this burden for informing research priorities and resource allocation worldwide. To achieve this, we employed a novel methodological approach that considered the underlying, immediate and intermediate causes of death associated with each causative agent, pathogen group, infectious conditions and aggregate categories. By examining every death where a pathogen or infectious entity played a role in the pathway to death, we derived a measure termed the "burden associated with infection". This measure combined various data sources to estimate the burden of immediate and intermediate causes of death associated with each pathogen, pathogen group and/or infectious disease. To compare the burden among all causes, we utilized pathogen-specific ratios, incorporating data from multiple sources (such as cause of death records and hospital discharge data). By multiplying these ratios by age-specific years of life lost (YLLs) and adding the adjusted YLLs to age-specific years lived with disability (YLDs), adjusted DALYs were calculated to account for deaths along the pathway to death.

The findings revealed that globally, an estimated 704 million DALYs were associated with the 85 pathogens studied in the last pre-COVID year. Of these, 309 million DALYs were attributed to children under 5 years old, comprising 43.9% of the total burden. Substantial regional disparities were observed, with sub-Saharan Africa bearing the highest burden and the high-income super-region the lowest. Three leading pathogens – tuberculosis, malaria and HIV/AIDS – were responsible for over 50 million DALYs each. Additionally, previously less heralded pathogens such as Staphylococcus aureus and specific Gram-negative bacterial species (such as Klebsiella pneumoniae and Helicobacter pylori) contributed significantly to the overall burden. In a cross-country comparison in South Eastern Europe, we observed significant differences among leading pathogens and communicable cinditions, which carries important policy implications. These findings underscore the need for targeted investments and research funding to address the disproportionate impact of infectious diseases, particularly in low-income and middle-income countries. By highlighting the magnitude of the problem and identifying research funding mismatches, this specific study approach provides valuable insights to guide future public health interventions and resource allocation strategies.

THE USE OF BETA- LACTAM ANTIBIOTICS AND THE INCREASE OF RESISTANCE TO CARBAPENEMES IN INTENSIVE CARE UNITS IN CLINICAL CENTER NIŠ

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Objective: antimicrobial resistance as one of the greatest threats to human health. One of the most important factors leading to the emergence of resistant bacteria is overuse of antibiotics. The purpose of this study was to investigate the correlation between antimicrobial usage and bacterial resistance of *Enterobacterales* over a 4-year period (2018-2022.) in intensive care units in the Clinical Center Niš, one of the biggest tertiary care hospitals in Serbia. We particularly paid attention to the possible relationship between the consumption of carbapenems (imipenem, meropenem, ertapenem) and beta lactam antibiotics (ampicilin, amoxicillin-clavulanat, ceftriaxone, ceftazidime, cefepime, piperacillin-tazobactam) and the rates of resistance of *Enterobacterales* to carbapenems. Methods: Utilization of antibiotics expressed as defined daily doses per 100 bed days (DBD). Bacterial resistance was reported as the percentage of resistant isolates among all tested isolates. Results and Discussion: Our results suggest that cephalosporins were the most used antibiotics during the entire observed period 2018-2022. A significant increase in resistance trends was seen in ertapenem, from 20.4% resistant isolates to 40.98% ($p<0,0001$, $x^2 = 197.35$), imipenem from 11.2% resistant isolates to 26.39% ($p<0,0001$, $x2 = 148.24$), and meropenem from 10% resistant isolates to 26.53% ($p<0,0.0001$, $x^2 = 178.23$). The correlation between the consumption of carbapenems and the resistance to imipenem in *Enterobacterales* shows significance ($p<0,01$). We found a good correlation between the use of all beta lactam and enterobacteria resistance to carbapenems. Conclusion: our data demonstrated a significant increase of antimicrobial resistance trends in carbapenems, significant correlation between the consumption of antibiotics, especially carbapenems and beta lactams, and rates of antimicrobial resistance of *Enterobacterales* to imipenem and meropenem.

Key words: antibiotic utilization, antimicrobial resistance, *Enterobacterales,* carbapenems

Poster presentation

ANTIMICROBIAL ACTIVITY OF *VERBASCUM NIVEUM* TEN. EXTRACTS AGAINST *STREPTOCOCCUS PNEUMONIAE*

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Objectives: Mullein flowers have expectorant, mucolytic, and demulcent properties and are used to treat respiratory disorders, such as dry coughs, bronchitis, pertussis, asthma, and tuberculosis. As *Streptococcus pneumoniae* is often the causative agent of pneumonia, the aim of our work was to test the antibacterial activity of *Verbascum niveum* Ten. against *S. pneumoniae*.

Materials and methods: Six different extracts (flower and leaf extracts were made with three different solvents: 50% ethanol, distilled water, and 80% propylene glycol) were tested against *S. pneumoniae*. Ten serial doubling dilutions of each sample were prepared (0.20 mg/ml – 100 mg/ml) in microdilution assay, and the results were expressed as minimal inhibitory concentrations (MIC).

Results: Our results indicate that all tested extracts possess strong antimicrobial activity. The MIC values ranged between 0.20 mg/ml and 1.56 mg/ml. In general, folium extracts had stronger activity (folium ethanol extract being the strongest one) than flower extracts (all flower extracts showed the same activity – 1.56 mg/ml).

Conclusion: According to our results, all studied extracts are potential antimicrobial agents with strong activity against *Streptococcus pneumoniae*. This may partially explain mullein's effectiveness in respiratory disorders, but detailed studies are needed to confirm it.

Key words: *in vitro*¸ mullein, antibacterial activity, MIC

BACTERIAL RESISTANCE TO ANTIBIOTICS IN OUTPATIENT UROGENITAL INFECTIONS

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Objectives: This study analyzes the resistance level of bacteria causing urogenital tract infections, to the most commonly used antibiotics.

Materials and methods: Data on infection causes and antibiotic resistance were obtained from patient records in the Braničevo district for 2022 and 2023, provided by the Public Health Institute Požarevac. The sample includes over 20,000 outpatient urine cultures. Additionally, the frequency of different antibiotic applications was determined based on data from the Pharmacy Institution Požarevac. Combining these data types identified the most common infection-causing agents and the most frequently used antibiotics. Finally, the resistance levels of the most common bacteria to several widely used antibiotics were analyzed.

Results: The most common causative agent of urogenital infections was identified as Escherichia coli, responsible for nearly 60% of cases, followed by Klebsiella-Enterobacter spp. at about 17%. The results indicated that Escherichia coli exhibited resistance to the four most commonly used antibiotics—ciprofloxacin, cephalexin, fosfomycin, and trimethoprim-sulfamethoxazole in 32%, 13%, 19%, and 37% of cases, respectively.

Conclusion: The results indicate varying bacterial resistance levels to some of the most commonly used antibiotics. This highlights the importance of continuously monitoring antibiotic resistance levels and adherence to the National Guide for the Prevention and Treatment of Uncomplicated Urinary Tract Infections. Such practices can enhance the efficiency of treating these infections.

Key words: Antibiotic Resistance, Urogenital Infections, Escherichia coli, Klebsiella-Enterobacter spp.

MOLECULAR DYNAMICS SIMULATIONS OF CEFTRIAXONE AS DRUG CANDIDATE TO PREVENT PATHOLOGICAL ALPHA-SYNUCLEIN AGGREGATION IN PARKINSON'S DISEASE DEMENTIA

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Objectives: Parkinson's disease (PD) is a neurodegenerative disorder characterized by the aggregation of alpha-synuclein (α-syn) proteins. Ceftriaxone, a β-lactam antibiotic, is currently in Phase II clinical trials for PD treatment due to its neuroprotective properties. This study investigates the molecular dynamics (MD) of ceftriaxone interaction with α-syn to elucidate its potential mechanism in preventing α-syn aggregation.

Materials and methods: Molecular dynamics simulations were performed using the Desmond software. The crystal structure of α-syn (PDB ID: 1XQ8) was utilized to model the interaction with ceftriaxone. The simulation parameters included a simulation time of 100 ns, an explicit solvent model, and physiological conditions.

Results: The MD simulations revealed significant binding interactions between ceftriaxone and α-syn, primarily through hydrogen bonding and hydrophobic interactions. Ceftriaxone binding induced conformational changes in α-syn, leading to a reduction in the protein's propensity to form aggregates.

Conclusion: This study provides molecular insights into the mechanism by which ceftriaxone may inhibit α-syn aggregation, a hallmark of PD pathology. Given the ongoing Phase II clinical trials, these findings underscore the therapeutic potential of ceftriaxone in PD treatment and highlight the importance of molecular dynamics studies in drug development.

Keywords: Parkinson's disease, Ceftriaxone, Molecular dynamics simulations

THE POWER OF MOLECULAR DYNAMICS: RIFAMPICIN'S IMPACT ON Aβ42 AGGREGATION IN ALZHEIMER'S DISEASE

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Objectives: Alzheimer's disease is a progressive neurodegenerative disorder characterized by the accumulation of amyloid-beta (Aβ) plaques. Rifampicin, an antibiotic with established efficacy in AD treatment, has shown promise in preventing Aβ aggregation. This investigation harnesses the capabilities of molecular dynamics to simulate the structural disruption of Aβ42 oligomers by rifampicin, aiming to uncover the mechanistic basis of its anti-aggregative properties.

Materials and methods: Molecular dynamics simulations were conducted using the Desmond program for a duration of 100 nanoseconds. The crystallographic PDB structure of the Aβ42 oligomer (PDB ID: 7O1Q) was employed to analyze the interaction between rifampicin and the oligomer.

Results: Rifampicin was found to destabilize the β-sheet structure of the Aβ42 oligomer, a crucial component for amyloid aggregation. The interactions between rifampicin and the Aβ42 oligomer were mediated through the phenolic, hydroxyl, ester, and piperazine groups of the rifampicin molecule, engaging with specific amino acids in the oligomer.

Conclusion: The results suggest that rifampicin can effectively disrupt the β-sheet structure of Aβ42 oligomers, thereby potentially preventing their aggregation. These findings highlight the potential of rifampicin as a therapeutic agent in the treatment of Alzheimer's disease by targeting amyloidogenic protein oligomers.

Keywords: Alzheimer's disease, Rifampicin, Molecular dynamics simulations

USE OF CEFALOSPORINS IN A SEVEN YEAR PERIOD IN THE UNIVERSITY CLINICAL CENTER OF NIŠ

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Objectives: The aim of the research is to analyze the consumption of cephalosporins, with an emphasis on ceftriaxone and cefuroxime in the University Clinical Center of Niš in the period from 2017 to 2023.

Materials and methods: The use of cephalosporins was monitored during the study period at the University Clinical Center of Niš. We used ATC/DDD methodology, the results were expressed as the number of defined daily doses/100 patient days (DBD).

Results: Antibiotics are one of the most prescribed drugs in hospitalized patients. Cephalosporins have a wide range of indications, which contributes to their frequent prescription. In seven-year period of follow-up we registered an increase in use of cephalosporins, with a highest increase in use from 2020, which can be explained by the beginning of the COVID-19 epidemic. Hospital ceftriaxone consumption was significantly increased in 2023 from 12.96 in 2017 to 24.46 DBD (53%), p<0.01. In contrast to ceftriaxone, cefuroxime consumption was reduced from 4.53 in 2020 to 2.1 in 2023 (46.35%).

Conclusion: The obtained results show a significant increase in the use of ceftriaxone in the examined period. The increased use of cephalosporins can lead to a rise in antimicrobial resistance, which can lead to reduced effectiveness of this group of antibiotics.

Key words: Cephalosporins, ceftriaxone, cefuroxime, antimicrobial resistance

SESSION: CURRENT PARASITOSIS

INVITED LECTURE

UPDATE ON LEISHMANIASIS: AN UNDERESTIMATED THREAT TO EUROPE IN TODAY'S WORLD

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Leishmaniasis has been a common parasitic infection in tropical and subtropical regions of the world. It is a vector-borne disease, transmitted by sand flies and manifest mostly as cutaneous infection, followed by less common but life-threatening visceral leishmaniasis and mucocutaneous leishmaniasis, which is mainly limited to South America, today. Incidence of leishmaniasis exceeds a million cases, where more than 75% of them manifest with cutaneous infection, which is not lethal and marked with the presence of a large skin lesion exposed to sandflies. However, visceral leishmaniasis can be life-threatening for patients, if not diagnosed and treated promptly on time.

Today, not only the incidence but also the number of foci of leishmaniasis have been on the rise in many regions of the world, like many other vector-borne diseases, despite evolving public health measures against the spread of the transmitting vectors. Main reasons of this uprise are the immigration problem, global warming and the development of more sensitive diagnostic methods for infectious diseases, including leishmaniasis. Today more than 280 million people in the world, that accounts for 3.6% of the world population, which was only 2.8% in 2000, are away from their homes for various reasons including wars, political unrest, famine and poverty. Dislocation of people from leishmaniasis-endemic regions to non-endemic destinations causes the spread of the disease. Indeed, as observed in Turkiye after the influx of millions of Syrian refugees after 2012, the epidemiology of leishmaniasis may be modified through the development of hybrid Leishmania strains and new phylogenetic clades of Leishmania spp. On the other hand, increase in the average temperatures prolongs vectors' survival which increases the exposure rates of humans to them, and thus increases the incidence of leishmaniasis.

The aim of this presentation is to share the current status of leishmaniasis in Eastern Europe and mainly Turkiye, which is situated on the cross-roads of three continents and therefore is the main pathway of old world immigrants to Europe, observed changes of the infection after the immigrants and possible outcomes of this to Europe, in the light of the latest publications and updated data.

PARASITIC INFECTIONS IN THE CONTEXT OF MIGRATION, GLOBALIZATION AND CLIMATE CHANGE

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Parasites are globally one of the most common causes of morbidity and mortality from infectious diseases in the human population. Globalization has led to the intentional and unintentional migration of people, animals, products and services at the world level, but at the same time to the migration of microorganisms. Climate change and the resulting migration of vectors of certain parasitic diseases to hitherto non-endemic parts of the world have led to the fact that some parasitic microorganisms are found in regions where they were previously unknown. At the same time, the change in dietary habits, the inclusion of foods from "exotic" parts of the world in the diet, as well as trips, both tourist and business, led to more frequent contact of people with the "new", both for lay individuals and the medical community, unknown or poorly known parasitic organisms. All of the above complicated the differential diagnosis in the patient, placing additional demands on the practicing physician. Since parasitological diagnostics is still often morphological today, employees of microbiological laboratories should be aware of the possibility of the occurrence of parasites that we have never or rarely encountered, and have now become and will become part of our diagnostic routine.

Keywords: migration, globalization, climate change, parasites

Oral presentation

COMPARISON OF MALDI TOF MASS SPECTROMETRY AND INTEGRAL SYSTEM YEASTS PLUS TEST IN DIFFERENTIATION OF YEASTS SPECIES

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Objectives: Identification of Candida spp. is essential due to their different sensitivity to antifungals. Recently, many commercial tests have been introduced to determine yeast species. However, MALDI-ToF MS (Matrix Assisted Laser Desorption and Ionisation—Time of Flight Mass spectrometry) is, next to the PCR method, considered the reference standard. The aim of this research was to determine the sensitivity, specificity, and other diagnostic efficiency parameters of the commercial Integral System YEASTS Plus (ISYP) test compared to MALDI-ToF MS.

Materials and methods: After a mycological analysis using a standard protocol, three hundred yeast isolates, the causative agent of vulvovaginal candidosis, were identified based on morphological and biochemical characteristics determined by the ISYP test (Liofilchem®, Italy). After applying this commercial test, all species were determined using MALDI-ToF MS (Bruker Daltonics, Bremen, Germany). The ISYP test and the reference standard were compared by applying the Chi-square test and calculating the Cohen kappa value (Ckv).

Results: By comparing the results obtained using these two tests, perfect agreement was established for the species C. albicans and C. parapsilosis (Ckv=1). Almost perfect agreement was recorded for the species C. glabrata (Ckv=0.913), C. krusei (Ckv=0.898), and S. cerevisiae (Ckv=0.921)., while moderate agreement was detected among the species C. kefyr (Ckv=0.582) and C. lusitaniae (Ckv=0.497).

Conclusion: Since the comparison of the diagnostic efficiency of the examined tests gives satisfactory results, the commercial ISYP test can be used in routine work as a more straightforward and economically profitable method, but only with the determination of morphological characteristics, as well as with the examination of the filamentation test in the case of the species C. albicans.

Key words: MALDI-ToF-mass spectrometry, yeasts, Candida spp., Saccharomyces cerevisiae, diagnosis

Poster presentation

HYDATID DISEASE - 20 YEARS OF EXPERIENCE AT OUR INSTITUTION

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Objectives: This work aimed to show the elements of clinical presentation, the importance of radiological imaging procedures in diagnosis, treatment and possible complications.

Materials and methods: This retrospective study included patients under 18 treated operatively in our institution over 20 years (2004-2024), by reviewing the available medical documentation.

Results: The total number of patients for the examined period was 31. There were 9 girls (29%) and 22 boys (71%), average age 10.4 years. There were 20 (64%) patients from rural areas, and 11 (36%) from urban areas. Solitary echinococcal cysts were present in most patients, with the most common localization in the liver. The average cyst size regardless of organ was 5.8 cm. In all patients, the diagnosis was made preoperatively by radiological methods, depending on the localization, and preoperatively anthelmintics were prescribed. All patients underwent cystectomy with pericystectomy using the open method. Complications included: biliary cyst, biliary fistula, ileus, hydropneumothorax, pneumothorax, bronchopleural fistula, febrility and wound granulation.

Conclusion: The most common liver cysts are of parasitic origin. Clinical symptomatology remains absent until the size or rupture of the cyst leads to appropriate symptomatology, and sometimes cysts are detected by routine US and X-ray examination. Timely diagnosis and surgical intervention reduce the possibility of complications.

Key words: cysts, echinococcus, children

SESSION: CHALLENGES OF ORGANIZING HEALTHCARE SERVICES

DIGITAL DISEASE MONITORING IN NEURODEGENERATIVE DISEASES

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Neurodegenerative disorders (NDDs) are characterized by neurodegeneration as their primary feature. This devastating process is accompanied by loss of neurons and marked by decline in functions of central nervous system. The most common two NDDs are Alzheimer's disease (AD) and Parkinson's disease (PD). Despite the accumulating body literature on NDDs, many public health-related aspects remain elusive. Relatedly, application of large-scale digital transformation technologies, driven by advanced IT infrastructure, big biomedical data and AI, is still scarce. Considering the challenge of NDSs in aging populations and the need for more definitive biomarkers, there is an imperative for development of compelementary, innovative approaches. Disease monitoring, as a subfield of public health, have underwent dramatic changes and major transformation in the last decade, giving rise to new research directions. Recently, the exponential growth of biomedical data, recent push for digitalization and advent of deep learning models have added a new dimension. In this context, implementation of digital disease monitoring have already proved useful and demonstrated its usability in the AD and PD research. However, the respective applications for the relatively rare NDDs, such as Huntington's disease (HD) and Amyotrophic lateral sclerosis (ALS), are still largely missing. Hence, more efforts towards bridging this research gap and implementation of overarching research designs are largely needed. Overall, the ongoing progress in and wide adaptation of digital disease monitoring are expected to expand the current knowledge of NDDs with novel insights and digital biomakers, thereby facilitating new strategies to combat these diseases.
Keywords: Digital disease monitoring, neurodegenerative diseases, big biomedical data

BURNOUT SYNDROME, CHARACTERISTICS, HOW TO RECOGNIZE IT, AND TAKE ACTION

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Burnout, classified as an occupational phenomenon in the 11th Revision of the International Classification of Diseases (ICD-11), is described as resulting from "chronic workplace stress that has not been successfully managed" (1).

Burnout is a term that has been known for 60 years. It appears for the first time in 1961 in the title of the novel "A burnt-out case" by the English author Graham Greene. In the story, the famous architect no longer finds satisfaction or meaning in art and life. Disappointed, he leaves his former life and moves to a leper colony in Congo. There, a local doctor diagnosed him with a mental illness he calls "combustion"—the mental equivalent of a leper who had gone through the stages of mutilation (2). However, the architect slowly found a cure for his illness through his work with leprosy patients

In professional literature, psychologist Herbert Freudenberger introduced the term "burnout" in 1974. This term was introduced to denote an employee who "burns out" at work (completely worn out and exhausted) for any reason and is no longer able to perform the job. Freudenberger characterized burnout as a loss of motivation and initiative, coupled with a sense of disappointment. This condition is accompanied by somatic and behavioral symptoms, particularly in service workers who work intensively under pressure with minimal financial compensation (2).

Burnout syndrome

Burnout was included in ICD-10 and remains in the same category in ICD-11, but the definition is now more detailed. "Burn-out is a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed. It is characterized by three dimensions: feelings of energy depletion or exhaustion; increased mental distance from one's job, or feelings of negativism or cynicism related to one's job; and reduced professional efficacy. Burn-out refers specifically to phenomena in the occupational context and should not be applied to describe experiences in other areas of life." Burnout is included as an occupational phenomenon and it is not classified as a medical condition (1). The definition used aligns with that established by Maslach et al., (4). leading some authors to believe that using the Maslach Burnout Inventory for assessing burnout syndrome is implicitly encouraged. While the WHO has included burnout in the ICD, it simultaneously denies that burnout is a disease but a syndrome. Additionally, the issue of recognizing burnout as an occupational disease remains unresolved ((5,6).

Burnout is defined as a work-related mental state. psychologically speaking, "work" refers to those structured, goal-directed activities that are obligatory in nature and require strain against the environment (6). The question arises where burnout occurs, only in those who work or not? According to definition of work, the activities of athletes, volunteers, and students can be considered "work," and therefore, they may also experience burnout. A recent study has revealed that parents can also experience burnout. Known as parental burnout, this condition is marked by overwhelming exhaustion related to one's parental role, emotional distancing from one's children, and a sense of parental ineffectiveness. This study indicates that parental burnout, much like job burnout, is linked to depressive symptoms, addictive behaviours, sleep disorders, and conflicts within the couple (7). In contrast, housewives/househusbands, retirees, and the unemployed do not engage in structured, targeted, and obligatory activities and therefore cannot experience burnout. However, they

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may still feel exhausted and suffer from cognitive or emotional impairments. This is not due to the specific activities they engage in but rather their social role, which lacks a clear focus, goal, and fixed time structure. Additionally, the activities they undertake are generally voluntary rather than mandatory. A challenge occurs when measuring burnout in employees who are no longer working, such as those on sick leave. However, it remains important to assess exhaustion, mental distance, and cognitive and emotional impairments in employees who have left work due to burnout. This is crucial for monitoring the progress of treatment, counselling, or return-to-work programs (6). In contrast to this approach, some researchers argue that burnout can also be measured in unemployed or retired individuals (8).

Professions that involve extensive interaction and communication with people, such as medical and social work, law enforcement, and legal professions, are particularly susceptible to the development of burnout syndrome (9). Additionally, research indicates that teachers and educators face high levels of stress (10). Researchers observed a high prevalence of burnout in professions characterized by high job demands and time pressure, such as managerial roles (11). The prevalence of burnout among physicians varies, with reported rates including 67.0% for overall burnout, 72.0% for emotional exhaustion, 68.1% for depersonalization, and 63.2% for low personal accomplishment (12). Among palliative care nurses, burnout prevalence rates are 24% for emotional exhaustion, 30% for depersonalization, and 28% for low personal accomplishment (13). Burnout rates among medical students range from 7.0% to 75.2% (14). These prevalence rates, based on meta-analyses using the Maslach Burnout Inventory (MBI), vary due to country-specific factors, interpretation of results, and cutoff criteria for burnout symptoms. Between 1% and 9% of athletes showed high burnout scores on the four subscales of the Eades Burnout Inventory (15).

Burnout syndrome is an individual's response to ongoing work stress that gradually develops and can become chronic, leading to health issues. Psychologically, this syndrome affects cognitive, emotional, and attitudinal aspects, resulting in negative behaviours towards work, colleagues, clients, and the professional role itself. However, it is not a personal issue but rather a consequence of specific work-related factors (2). Factors that lead to the development of burnout syndrome at work can be individual, work environment factors, and social factors. Individual factors include socio-demographic characteristics, attitudes toward work, work habits (such as excessive expectations), lifestyle characteristics, and personality traits. Factors in the work environment associated with the development of burnout include workplace characteristics and client-related characteristics. Workplace characteristics encompass long working hours or overtime, workload and obligations, shift work, poor working conditions, lack of necessary equipment and materials, lack of autonomy in performing tasks and making decisions, lack of recognition from superiors, limited opportunities for advancement, financial constraints, workplace conflicts, and loss of colleague support. Client-related characteristics involve the nature and frequency of client contact, emotionally demanding jobs that require managing or expressing emotions and empathy, and dealing with demanding clients (16). Social factors contributing to burnout include economic pressures, cultural expectations, and technological advancements, including digital connectivity. Stressful situations perceived as insurmountable by employees, such as mismatched goals, ideas, and work tasks, along with unsuccessful attempts to complete these tasks in poor working conditions and with poor interpersonal relationships, lead to excessive workload and job dissatisfaction, which are characteristic of burnout syndrome. It is crucial to emphasize that burnout syndrome is primarily a result of certain working conditions rather than an individual's personality traits. The triggers of burnout are generally related to work factors such as job content, structure, or relationships with users, clients, bosses, and colleagues. However, individual factors can act as moderating variables in this process. For instance,

personal traits like a lack of self-confidence or reliance on stress-avoidance coping mechanisms may amplify the impact of situational factors. Conversely, other personal characteristics, such as optimism or active coping strategies, can mitigate or even slow down the negative effects of organizational factors on burnout and its consequences (2).

Instruments for measuring burnout syndrome
Numerous instruments have been developed to assess burnout syndrome in the workplace. Some of these tools are designed for specific professions, such as the Teacher of Physical Education Burnout Inventory (TPEBI) for assessing burnout among physical education teachers (17). Others are applicable across various professional settings (18). One of the divisions of instruments for measuring burnout syndrome, used in the analysis and development of the novel Burnout Assessment Tool (BAT) (6), is based on psychometric characteristics (reliability and validity) as well as the frequency and nature of their use.
The first group comprises instruments with established psychometric quality:
1.   Maslach Burnout Inventory, MBI) (1981)
2.   Oldenburg Burnout Inventory, OLBI (2003)
3.   Bergen Burnout Inventory, BBI (2011)
4.   Copenhagen Psychosocial Questionnaire, COPSOQ (2005)
5.   Spanish Burnout Inventory (2011)
6.   Granada Burnout Questionnaire, GBQ (2013)
7.   BurnOut-Neurasthenia Complaints Scale (2006)
8.   Shirom-Melamed Burnout Measure, SMBM (2006)
9.   Burnout Measure, BM (1981)

The second group includes three questionnaires with unknown psychometric qualities:
1.   Boudreau Burnout Questionnaire, BBQ (2006)
2.   Hamburg Burnout Inventory, HBI (2017)
3.   Instrument for the Early Detection of Burnout, IVOB (2017)

All these questionnaires utilize a Likert scale to assess the frequency of burnout symptoms, with scales ranging from four to seven points. Additionally, most scales (76%) use negatively worded items, while only five scales (7%) use positively worded items, and 11 scales (17%) include both negatively and positively worded items (6).
One of the first definitions of burnout syndrome was provided by Christina Maslach in the 1970s. She defines burnout as a psychological syndrome of exhaustion, depersonalization, and professional inefficacy, resulting from a prolonged response to chronic interpersonal stress at work (19). This definition is the most widely used in scientific research, along with the Maslach Burnout Inventory (MBI), which was used in 85.7% of studies from 1991 to 2018 (12). Exhaustion is the primary response to stress and involves feeling overwhelmed and depleted of emotional and physical resources. Employees experiencing exhaustion feel worn out, lacking energy, and unable to face another working day or manage conflicts with others (20). This aspect of burnout includes the inability to handle new emotional situations and a lack of professional fulfillment, leading to feelings of unproductiveness and distrust in one's abilities (21). Depersonalization (Cynicism) is characterized by a cynical and negative attitude toward clients, developing as a response to emotional exhaustion. Initially, this cynicism acts as a self-protective emotional buffer of "independent concern." Depersonalization represents the interpersonal dimension of burnout (20). Professional inefficacy and unfulfillment involve a reduced sense of work productivity and competence, leading to self-judgment of failure. This component represents the self-evaluation dimension of burnout (20). Employees experiencing this feel distanced from clients and colleagues, find

it difficult to progress, and face increased pressure at work. Emotional exhaustion often leads to physical exhaustion as well.

The prevalence differences observed when using the Maslach Burnout Inventory (MBI), can be attributed to methodological heterogeneity among the studies. This variability is partly due to evolving definitions of burnout and issues with the conceptual framework of the burnout construct. Maslach defines burnout through three domains: emotional exhaustion, depersonalization, and low personal accomplishment. Also, the older third edition of the MBI manual provided cutoff scores for burnout based on tertiles derived from a convenience sample of healthy workers, but it warned against using these scores for diagnostic purposes. Maslach advocated for defining total burnout as high emotional exhaustion accompanied by either high depersonalization or low personal accomplishment. However, some researchers argue that high scores in emotional exhaustion or depersonalization alone, without considering low personal accomplishment, might more accurately identify individuals with burnout. Furthermore, some suggest that personal accomplishment may not be a core component of burnout. Although the MBI conceptualizes burnout as a work-related phenomenon, evidence indicates that it does not effectively distinguish between symptoms caused by work stress, non-work stress, or a combination of both. The original and most widely used version of the MBI, the MBI-Human Services Survey (MBI-HSS), specifically frames burnout as a consequence of interpersonal stress (12,22).

Kristensen et al. addressed the limitations of Maslach's definition and instrument, which examines burnout syndrome as a single concept across three dimensions. They developed a new instrument that independently assesses three distinct concepts of burnout: personal burnout, work-related burnout, and client-related burnout. The core components of the burnout syndrome are fatigue and exhaustion. Personal burnout is defined as "the degree of physical and mental fatigue and exhaustion that a person experiences" regardless of their work environment. This scale allows for the comparison of burnout among respondents regardless of work status, making it applicable to young people, the unemployed, and retirees. The questions about personal burnout are formulated in a way that everyone can answer them. Work-related burnout is defined as "the degree of physical and mental fatigue and exhaustion that a person experiences in relation to their work." These questions are intended for respondents engaged in any kind of paid work. Client-related burnout is defined as "the degree of physical and psychological fatigue and exhaustion that a person experiences in relation to working with clients." The questions about client-related burnout include the term "client" or a similar term appropriate to the type of work and the clients the employee interacts with (23). Kristensen et al. developed the Copenhagen Burnout Inventory (CBI) which has several advantages over the Maslach Burnout Inventory. It independently examines three distinct aspects of burnout: personal burnout, work-related burnout, and client-related burnout. This makes the CBI applicable to a wide range of professions, and its first section can be used regardless of employment status, making it suitable for young people, retirees, and the unemployed (8). The CBI has been utilized across various professions, including teachers, service workers, healthcare workers, university students, professors, and academic staff. Because off its accessibility and non-commercial nature, the CBI has been widely accepted, translated, and adapted to various cultural contexts around the world, including Africa, Australia, Brazil, China, Denmark, Greece, Iran, Italy, Japan, Malaysia, New Zealand, Portugal, Spain, Thailand, and Serbia (24).

Due to the recognized shortcomings of existing burnout syndrome questionnaires and ongoing scientific debates about which dimensions should be included or excluded, a group of researchers developed the Burnout Assessment Tool (BAT) as part of a three-year project. This new questionnaire is effective in assessing the risk of burnout. Researchers agree that emotional exhaustion is the core component of burnout. Additionally, burnout is

characterized by reduced cognitive performance, with impairments in functions such as attention, concentration, and working memory (25). Although two years after treatment, patients showed improvement in several cognitive tasks, their performance remained below that of normal, healthy individuals (26). A comparative Swedish study reached a similar conclusion; even three years after seeking help, patients' cognitive functions related to speed, attention, and memory were still not at normal, healthy levels (27). This indicates that cognitive impairment is not only a part of burnout syndrome but also persists for a long time, even after other symptoms have subsided. Also, professional inefficiency and unfulfillment are not intrinsic components of the burnout syndrome but are rather consequences of it. According to this new approach, burnout is defined as a work-related state of exhaustion experienced by employees. It is characterized by exhaustion, emotional impairment, cognitive impairment, and mental distance. These four core dimensions of burnout are often accompanied by psychological distress, psychosomatic complaints, and depressed mood (6). The Burnout Assessment Tool (BAT) was developed and it can be viewed both as a one-dimensional questionnaire, providing a single overall burnout score, and as a four-dimensional questionnaire, assessing four closely related aspects of burnout. However, it is important to note that the BAT is not suitable for differential diagnoses such as depression, work engagement, workaholism (work addiction), and job boredom. Burnout, while sharing some symptoms with these conditions, requires a comprehensive assessment that considers multiple factors and diagnostic tools to accurately identify and differentiate it from other psychological and work-related issues. To date, the BAT has been translated into 27 languages. There are two versions of BAT, BAT-33 (the full version consists of items to measure the core dimensions of burnout (BAT-C) as well as the secondary dimensions, BAT-S), and the shorter version BAT-12 (three questions for each of the four dimensions). It is preferable to use the full version of the BAT for individual assessments and screening aimed at identifying those at risk of burnout. This is primarily because the full version offers more accurate and detailed results, as it includes more questions, leading to a finer-grained distribution of scores. Additionally, the shortened version is less effective at distinguishing between burnout and non-burnout cases. These considerations are particularly important for the subscales of the short version, though the total score can still be used for individual assessment and screening if a breakdown into specific core symptoms is not required. The BAT can be utilized for individual employee assessments, as well as for screening purposes, such as identifying individuals who are at risk of or experiencing burnout, and for benchmarking, which involves comparing burnout levels against the national workforce. Furthermore, the general version of the BAT is suitable for monitoring individuals who have been out of work for an extended period (several months) (6).

Preventive of burnout at work

Research has shown that employees facing high job demands and limited job resources are at an increased risk of burnout. Burnout syndrome should be recognized as a significant public health issue given its far-reaching consequences. Addressing it, demands comprehensive strategies that involve employers, healthcare providers, policymakers, and society as a whole to foster healthier work environments and establish robust support systems for those affected by burnout. Proactive behaviours such as feedback-seeking and individual innovation, as well as, long-recognized proactive behavioural activities such as helping, voice ("expression of constructive challenge intended to improve job"), and job crafting (staff members tend to redefine and reshape their job content, working methods, and collaborative relationships with other members of the team)have been associated with a positive impact on organizational outcomes (28–30). Preventive programs against burnout in the workplace typically involve a

combination of organizational, environmental, and individual-level strategies designed to reduce stress, improve work-life balance, and promote overall well-being.

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SOCIOECONOMIC INEQUALITIES IN THE UTILIZATION OF HEALTHCARE SERVICES AMONG THE POPULATION OF SERBIA

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Introduction: Socioeconomic inequalities in health were described as far back as the 16th and 17th centuries, but only recently has interest in their recognition and reduction become important for public health policy in many countries. A comprehensive approach to health emphasizes its close relationship with social and economic conditions, physical environment and individual lifestyle. Health inequalities can be considered the result of the cumulative impact of decades of exposure to health risks of those living in socioeconomically disadvantaged circumstances (1). Socioeconomic status has been singled out as an important determinant of unequal access to health services (2). Many studies suggest a relationship between socioeconomic factors and health care utilization of people around the world. Less use of health services is more common in socio-economic groups of lower socioeconomic status, primarily due to financial difficulties. Also, low socioeconomic status is often associated with fear of treatment, due to lack of information. Unemployment is known as one of the important factors that contribute to the non-use of the health care system (3).

A study of socio-demographic factors associated with barriers to accessibility, availability and acceptability of using health care, identifies female gender as a significant predictor of disparity in the use of health care. The data show that people with a higher level of education and higher incomes use preventive health services more often than people with less education and lower incomes. The level of health education contributes to a clear perception of health problems. Low level of education, rural environment, fear of treatment, low level of access and lack of health literacy are associated with a decrease in the use of health care (4,5).

Also, many studies have recently indicated the presence of inequality that favors the rich when it comes to access to health care. The economically disadvantaged population relies more on public health institutions, while those with a higher socio-economic status tend to seek services in private institutions. Certain income linkages significantly contribute to greater use of public sector services among the poor, while wealthier individuals are more likely to use private sector services. Unequal access to health care services results in certain groups being disadvantaged in terms of their health (6,7). Also, the distribution of health care services is often inadequate or unavailable to marginalized or at-risk segments of society. The distribution of health care providers generally favors urban regions, making them inaccessible to a significant portion of the population living in villages and rural areas. Consequently, individuals often incur significant time and travel costs when seeking professional health care services (8). Therefore, these disparities in health status and use of health services are not inevitable or accidental. Inequalities arise due to the complex interaction of interrelated factors, many of which are to a large extent caused by the direct influence of individuals. Consequently, research into these factors becomes invaluable in developing health policy strategies aimed at reducing health disparities and inequalities. Consequently, solving these disparities implies social security vulnerable groups have equal

opportunities to achieve and maintain their health. The pursuit of regularity in health care implies the existence to eliminate inequalities in the provision of health services. This includes one approach to accessible care based on individual needs, legal use of services based on needs and ensuring one quality of health care for all individuals. Despite the long-standing recognition of the imperative to solve disparities in health, the public's attention to the key role of access to high-quality care, inviolable health insurance for ethnic minorities, immigrants, the disabled and the rural population remains insufficient (9,10).

Objectives: The objective of this paper is to assess the relationship between demographic and socioeconomic determinants and the use of health services among the adult population of Serbia.

Materials and methods: The study is a part of the population health research of Serbia, conducted in the period from October to December 2019 by the Institute of Statistics of the Republic of Serbia in cooperation with the Institute of Public Health of Serbia "Dr. Milan JovanovićBatut" and the Ministry of Health of the Republic of Serbia. The research was conducted as a descriptive, cross-sectional analytical study on a representative sample of the population of Serbia. For the purposes of this study, data on the adult population aged 20 years and older were used. The independent variables used during this research are demographic: gender, age, marital status and region, as well as socioeconomic: education, employment status and welfare index. On the other hand, the dependent variable of interest is the use of primary health care services. All data of interest are presented and analyzed using appropriate mathematical and statistical methods for the type of data.

Results: A total of 12,439 people aged 20 years and older were surveyed. The average age of the subjects was 52.8 ± 17.7 years, and women were significantly older than men ($t = -6.765$, $p < 0.001$). The majority of respondents are married or cohabiting (63.2%) and from the region of Šumadija and Western Serbia (32%). 56.4% of respondents had high school education, and women are significantly more likely to have primary school or lower education than men ($p < 0.001$). The largest percentage of respondents belongs to the poor category (40.4%). Almost two-thirds of respondents (61.4%) were unemployed or inactive. Men were employed significantly more often (42.9%) than women (32.2%) ($p < 0.001$).

A total of 96.8% of respondents have a chosen general practitioner, of which 91.2% are in state practice, and 5.6% are in private practice. Over 60 years old (48.1%) visit their chosen general practitioner most regularly. Every third respondent of the youngest age, aged 20-24, declared that they had never been to the chosen general practitioner (32.4%). Respondents from the region of Šumadija and Western Serbia, married or cohabiting, with secondary education, employed or unemployed, from the poorest strata, who rate their health as good or very good, said that they rarely visit their chosen general practitioner. Women also visit their chosen doctor more often.

33.8% of women declared that they have their own chosen gynecologist, 51.8% of them mostly in state practice and 15.9% in private practice. Having their own gynecologist in the state practice was most often stated by respondents who are married, those who have a high school education, who are unemployed (in terms of work status, followed by respondents from the wealthiest financial status (40.4%), more often from the East and of Southern Serbia (36%), who rate their health as very good or good and who are free of multimorbidity.Women with a rich financial status also use a private practice and have a chosen gynecologist in 53.5% of cases. Gynecologists are visited most regularly by

respondents aged 30-34 (59.4%). Respondents of the youngest age, from 20-24 years of age, most often declare that they have never visited a gynecologist (36%). Gynecologists are never visited by respondents with a lower or primary school education, the unemployed, i.e. those inactive in terms of work status, women from the poorest strata, from the regions of South and East Serbia, women who assess their health as very bad or bad, and those with multimorbidity.

More than two thirds of older adults stated that they have a chosen dentist (68.2%). A slightly higher percentage of adults had their chosen dentist in private practice, compared to the public sector (41.7% vs. 26.5%). A significant difference was observed in the use of dental health care based on gender, with women visiting the dentist more often (p < 0.001). The number of adults visiting their dentist of choice decreases with age (p< 0.001). The highest number of visits to the dentist was recorded in the age group of 20–34 years (29.1%), while the lowest number of visits was recorded in the oldest age group of 75+ years (4.2%). The highest percentage of respondents who regularly visit their dentist is in the married/cohabiting category (62.0%). Significant differences in visits to the dentist exist in relation to the regions. The highest percentage of adults from Šumadija and Western Serbia visit a dentist (34.4%), and the lowest percentage of adults from Southern and Eastern Serbia (20.7%). Adults without education or with primary education visit a dentist in 12.1%, which is a lower number of visits compared to adults with secondary (60.1%) and higher education (27.8%). At the same time, the majority of adults who have never visited a dentist are in the group of adults with the lowest level of education (61.7%), which is 12 times more than those with the highest level of education (5.1%). The population of adults, who according to the welfare index belong to the poorest category, visit the dentist in a smaller percentage (32.1%) compared to adults who belong to the richest category of the population (48.9%) (p < 0.001). Accordingly, the highest percentage of those who have never been to a dentist is among the poorest adults (56.5%), which is 2 times more than among adults who belong to the richest population group (26.2%). Employed adults tend to visit a dentist regularly (50.8%) compared to inactive adults who are more likely to never visit a dentist (59.8%).

Conclusion: The results suggest that individual sociodemographic factors influence the use of health services by Serbian adults and confirm the existence of socioeconomic disparities. It is necessary to investigate in more detail the disparities in all aspects of health care utilization, including the allocation of resources for health care, the quality of health services provided, the necessary workforce for the provision of health care services, and the financing of health care, especially in terms of the financial burden on individuals and households. Interventions that target different levels of influence are crucial and may yield superior efficacy compared to those solely focused on one level.

Key words: Socioeconomic inequalities, use of health services, adult population, Serbia

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E-CIGARETTE CONSUMPTION AMONG FEMALE STUDENTS OF FACULTY OF PHARMACY, NOVI SAD – KNOWLEDGE, ATTITUDES AND PRACTICES

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Worrying data on cigarette consumption is increasingly triggering a public debate on public health policy and youth education as part of addiction prevention.

Objectives: The paper will present the knowledge, attitudes, and practices of female pharmacy students regarding the consumption of e-cigarettes.

Materials and methods: A cross-sectional observational study was conducted using an original questionnaire distributed through the Google platform.

Results: The survey included 193 respondents. All respondents heard about e-cigarettes, 32.6% from social networks and electronic media, and 30.6% from the university; 53.4% of respondents have tried, and 31.6% currently use e-cigarettes and/or tobacco cigarettes. About 70% of respondents started smoking e-cigarettes to protect their/family members health. 52.5% to avoid the ban on smoking in public places, and only 21.3% for economic reasons; 99.0% believe that smoking e-cigarettes is harmful to health; 18.6% believe that e-cigarettes are less harmful than tobacco cigarettes; 52.3% of respondents believe that e-cigarettes do not represent a lower risk of cancer compared to tobacco cigarettes; and 73.8% expressed their desire to stop smoking cigarettes in the future.

Conclusion: The proven harmfulness of conventional and e-cigarettes to health, with special implications for the female population, should encourage new research and smoking prevention strategies.

Key words: e-cigarettes, addictions, female pharmacy students, knowledge, practices

CHALLENGES DURING TOOTH RESTAURATIONS WITH HYBRID GLASS-IONOMER CEMENTS WITH FLUOROPROTECTIVE EFFECT AMONG DENTISTS IN SOUTHEASTERN SERBIA

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Objectives: The introduction of new hybrid glass-ionomer cements with fluoroprotective effects into dental practice represents a significant advancement in preventing dental caries. These materials offer numerous advantages; but in some cases, they can be challenging when used in daily clinical practice. This study aims to analyze the main obstacles and difficulties encountered by dentists when using hybrid glass-ionomer cements.

Materials and methods: An online survey was conducted with 273 dentists using a Google Forms questionnaire.

Results: Although 7% of dentist believe that these fillings have mechanical deficiencies, the majority of dentist stated that these fillings use in patients with a high risk of caries and those who are difficult to cooperate with. However, 15% of dentist do not use these fillings at all. A fifth of the surveyed dentists indicated a lack of sufficient information about the use of these materials, and another fifth believed that the deficiencies of these materials were negligible.

Conclusion: Analyzing the experiences of dentists provides deeper insights into the practical aspects of using hybrid glass-ionomer cements, contributes to a better understanding of their advantages and disadvantages in clinical practice and suggesting new directions for researching the properties of these materials.

Key words: preventive dental medicine, hybrid glass-ionomer cement, online questionnaire

ONLINE INTERVENTIONS TO IMPROVE STUDENTS MENTAL HEALTH

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Introduction: Symptoms of depression and anxiety in univrsity students are often not recognized appropriately by health services. Interventions such as those recommended through various applications over the Internet offer one solution to improving access to treatment.

Aim: This study aimed to review the literature on Internet applications for improving mental health among students, in order to identify their effectiveness and usability.

Methods: The search included research on this topic in all relevant databases. In doing so, all formal procedures were implemented in order to resolve the risk of bias.

Results: A total of 55 studies met the inclusion criteria. The largest number of interventions was delivered through an Internet site. Many applications (38%) contained human support in the form of coaching. Most programs were effective (44%) in producing beneficial changes in major psychological outcome variables. About half of the studies did not present any usability or acceptability results, and several studies even questioned the widespread application of such apps to the mental health of university students. Quality assessments found moderate to severe risk of bias in many studies.

Conclusions: The results suggest that Internet-based mental health applications may be effective for improving psychological well-being among university students, but more rigorous studies are needed to determine the most effective elements of these interventions.

Keywords: mental health, students, psychological well-being

METHOD FOR ASSESSING THE RISK OF WORK IN THE HEALTH SECTOR

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Introduction: Psychosocial hazards related to work are things that can cause stress, which can then affect a person physically, psychologically, or both.

Aim: Our aim was to analyse these hazards in health activities in order to prevent them on all levels – national, institutional and individual.

Methods: Two standardized questionnaires were used: COPSOQ - Questionnaire for the assessment of psychosocial factors in the working environment (National Center for the Working Environment (NRCWE), Copenhagen, Denmark) and. WAI – Questionnaire for assessment of work ability index (National Institutes of Health and Safety at Work, Finland).

Results: ANOVA and the Tukey test showed that healthcare workers have significantly higher score values for 9 domains from the COPSOQ questionnaire, namely for the following domains: opportunity for improvement, predictability, rewards, role - definition, quality of leadership, social support, job satisfaction, trust in leadership, as well as justice and reputation.

In contrast, healthcare workers have significantly lower score values for 4 domains, namely for the following domains: emotional demands, work-family conflict, job burnout and stress.

In addition, healthcare workers have a significantly lower value of the cognitive demands score.

Conclusions: The practical importance of the method is reflected in program activities of an organizational nature based on concrete prevention measures, which reduce safety and psycho-social risks in the workplace, improve working ability and improve the quality of life.

Keywords: psychosocial hazards, risk assessment, health workers

EXPERIENCES IN THE IMPLEMENTATION OF THE ISO QUALITY STANDARD IN THE PUBLIC HEALTH INSTITUTE OF THE CENTRAL BOSNIA CANTON

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ISO standards are international standards that help establish and improve the quality and safety of goods and services. They are used to define requirements and work processes. The main parts of the standard are continuous process improvement activities after the implementation is completed, management's assumption of responsibility to meet the requirements, and continuous evaluation of the management system.

An integrated quality management system is used to minimize risk and ensure performance. The key advantages of using an integrated system are the improvement of competitiveness and reliability, increased awareness of the need for quality service, as well as greater efficiency and teamwork.

With the introduction of the ISO 9001:2015 standard, and the integration of the ISO14001:2015 standard, which includes environmental management standards, as well as the introduction of the ISO17025:2018 standard for testing laboratories, the Institute's competence and competitiveness on the market has been achieved.

Special attention is paid to risk management, and for each process an assessment of the risk of impact on the environment is carried out and actions are planned to prevent/mitigate these risks.

By implementing the standards, the Institute achieved numerous benefits, such as: a positive effect on business operations due to the absence of all types of errors, an increase in income due to positive competitiveness on the market, employee satisfaction due to continuous education, procurement of new equipment and improvement of the working environment. We are recognized as leaders in the preservation and protection of the environment. Our laboratories guarantee the reliability of test results, which is the result of conducting tests by educated and competent staff, working with certified reference materials, using the latest technology, and confirming the accuracy of results through interlaboratory comparison.

External controls, which are carried out regularly, confirm our determination to achieve excellence in the quality management system.

Keywords: ISO standards, quality, integrated quality management system, risk management

PHARMACISTS' COUNSELING PRACTICES FOR URINARY TRACT INFECTIONS: AN ONLINE SURVEY STUDY

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Objectives: To analyze the practice of pharmacists in counseling patients with urinary tract infection (UTI) symptoms.

Materials and methods: An online survey using *Google Forms* was conducted among pharmacists at the primary healthcare level during November and December 2023.

Results: The study included 380 pharmacists working in public pharmacies, predominantly female (91.6%), with an average age of 39.9 ± 10.7 years. Most of them work in large pharmacy establishments with more than five pharmacies (79.5%). The practice of counseling varies depending on whether the UTI is complicated. For uncomplicated UTIs, pharmacists commonly recommend herbal tea (97.7%), increased fluid intake (92.6%), dietary products (85.5%), a change in diet (51.6%), or refer the patient to a doctor (10.0%). For complicated UTIs, they mostly refer the patient to a doctor (95.5%) and advise increased fluid intake (61.3%), herbal tea (47.4%), dietary products (44.5%), and a change in diet (33.7%).

Conclusion: Pharmacists have a vital role in counseling patients with UTI symptoms and tailor their advice to the complexity of the infection. Pharmacists are more likely to counsel patients with uncomplicated UTIs, which is important as these patients often resort to self-medication. Enhanced collaboration between pharmacists and doctors is recommended to improve coordination in treating complicated UTIs.

Key words: Counseling, Pharmacist, Public pharmacies, Urinary Tract Infection

IMPROVING THE KNOWLEDGE OF EDUCATORS AND CHILDREN BY HEALTH-EDUCATIONAL TOOL -EDUCATIONAL CALENDAR

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Objectives: To assess the motivation, level of knowledge, and skills of educators who used an educational calendar for work with children.

Materials and methods: After the training and workshops about using the 2024 kids calendar, the educators (n=288) completed an online evaluation questionnaire. The evaluation questionnaire contains questions about the assessment of the educational calendar, impressions of working with children, educators' motivation level to work on health topics and their sufficient representation in daily work.

Results: Of the surveyed educators, 62.8% believed that health topics are sufficiently included in their daily work with children. Slightly more than half of the respondents (52.4%) assessed that they have a very high and 34.7% a high degree of motivation to discuss health topics with children. Respondents rated calendar elements such as theme, illustration, age appropriateness, content and applicability in working with children with an average score of 3.8 (on a scale of 1-5). In addition, the respondents evaluated elements of working with children, such as understanding illustrations and tasks, children's motivation, and discussion participation, with an average score of 3.7.

Conclusion: Considering educators' high level of motivation, it is necessary to create an educational tool by children's interests and modern technologies.

Key words: Health Education; **Health-education tool**, Educators

SCREENING TEST OF SPEECH FUNCTION AS PART OF PREVENTIVE EXAMINATION OF PRESCHOOL CHILDREN BEFORE ENROLLING IN SCHOOL

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Objectives: Before enroll in primary school, there is an obligation that every child should take a preventive examination by pediatrician, and different specialist. The aim of this article is to investigate and compare coverage of preschool children by preventive examination at all, and by screening test of speech function as part of preventive examination.

Methods: The data used in the analysis were collected from the Republic Health Insurance Fund's invoiced realizations at the primary healthcare level (PHC). We also collected reports from regional network of Institutes of public health, about performance of pediatricians and ORL specialist at PHC level.

Results: In 2023, there were 60,080 preschool children for enrollment in school in Serbia. The coverage of children by preventive examination by pediatrician is 102.7%, while the speech function screening test coverage, is 68% (40,853 children). Out of the total number of children covered by the speech function screening test, more than half (58.1%) need speech therapy treatment.

Conclusion: According to the data collected, it can be seen that the speech function screening test coverage in Serbia is reduced, which points to the conclusion that it is necessary to work on measures to improve the capacity of specific preventive services provision.

Keywords: Primary health care, preventive examinations, preschool children, screening test of speech function, speech therapy

SCREENING FOR TYPE 2 DIABETES AT PRIMARY HEALTH CARE CENTERS IN 2023

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Objectives: Screening for type 2 diabetes (T2DM) in adult population is introduced in primary health care centers (PHCC) in Serbia, and is performed by general practitioners (GPs). Aim of this article is to investigate and compare coverage of adult population in different administrative regions of Serbia by screening for T2DM, performed in PHCC in 2023.

Methods: We collected reports from regional network of Institutes of public health, about performance of GPs, including screening for T2DM. Those reports include data from Health Insurance Fund as invoiced realization of health services in 2023.

Results: According to data obtained from 25 administrative regions in Serbia, coverage of adult population (19+) by screening T2DM varies from region to region, and the highest coverage was in Nišava region (24%). Nišava region was the only region where coverage was above 20%, as it was originally planned. The lowest coverage was in North Banat and Central Banat region (around 2%). In all other regions, including Belgrade City, coverage was in an interval from 2.8% to 19.5%.

Conclusions: There is a need for improvement of skills and knowledge of GPs, in the area of T2DM, as well as creating conditions for increasing of coverage of adult population by screening for T2DM.

Keywords: Screening for type 2 diabetes (T2DM); Basic health care services; Primary health care; Health care regulations; Health needs.

RELATIONS OF ROOMMATES AND QUALITY OF SLEEP IN STUDENT DORMITORIES

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Background and Objectives: At the student age, relationships with colleagues become crucial, as young people begin to rely more and more on each other. This is especially pronounced in student dormitories. One of the key aspects of good mental health that could be affected by peer relationships is sleep quality. This review paper aims to summarize relevant studies in order to examine the quality of students' sleep in relation to possible emotional and behavioral factors that may arise through their interpersonal relationships.
Methods: The systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, according to its inclusion and exclusion criteria. Several articles had to be excluded from this study due to bias.
Results: There were 15 studies involving a total of 11,128 students. Positive relationships with dorm roommates have been shown to be potentially protective factors against sleep disorders. Likewise, the results indicated the existence of a vicious circle between negative relationships with roommates and healthy sleep. Specifically, negative peer experiences in the real world (ie, victimization and other social problems) as well as in the virtual world (eg, cyberbullying) were associated with poor sleep quality and vice versa—poor sleep quality may have detrimental effects on peer relationships. None of these studies, however, showed that living with roommates could be a predictor of sleep quality.
Conclusions: Students are subject to various risk factors that can affect the quality of sleep, which is why they are often the target population in such research.The evidence base is, however, primarily descriptive and mostly relies on the subjective experience of the respondents.When designing interventions to improve sleep quality among college students, all determinants should be considered.
Keywords: sleep quality, students, dormitory

NEW DIRECTIONS FOR THE DEVELOPMENT OF SOCIAL MARKETING

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The global disease burden requires the application of modern approaches to disease prevention and the promotion of healthy lifestyles, such as social marketing. The social marketing concept represents activities aimed at positive behavior change for the benefit of the individual and society.

Objectives: To show the goals, effects, and directions for the development of social marketing.

Materials and methods: Literature review.

Results: Social marketing uses the tools of conventional marketing to identify and solve social problems by influencing the adoption of new behaviors and healthy lifestyles. Global public health successes in eradicating polio, reducing infant mortality, and stopping the spread of HIV/AIDS correlate with social marketing actions and go beyond individual and short-term effects. The role and importance of social marketing was refreshed again during the COVID 19 pandemic. However, the public's high expectations cannot be realized without the application of modern tools and techniques based on digital technologies and the support of public policies.

Conclusion: The technological era has made it possible to create customized, almost personalized campaigns for the promotion of public health, in which the biggest barrier is the availability of the Internet, creating many opportunities and challenges for creators of social marketing programs and public policies.

Key words: social marketing, behavior change, healthy lifestyles, public health, public health policy.

SESSION: HEALTH PROMOTION IN THE YOUTH POPULATION

Invited lectures:

RISK FACTORS OF ARMED ATTACK AT SCHOOL AND PREVENTION MEASURES

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Introduction

A school shooting is an event in which a student at an educational institution that he or she attends, shoots and injures or kills at least one other student or faculty member at that institution. a school shooting does not mean an armed conflict after an argument between two people who are fighting each other, nor targeted attacks by armed gangs.

The attacks are public, targeting is random, and the shooter doesn't want to hide his identity. Although a shooter may have a list of children to target before a school shooting, the shooting and killing is not targeted at a specific person. It can be targeted at a specific department.

Risk factors

There are key risk factors for school shootings:

1.   Mental disorder, personality disorder or/and traumatisation.
The starting point for understanding school shooters is recognizing the existence of mental disorders. The first group of disorders are psychoses and disorders from the spectrum of schizophrenia (primarily schizotypal disorder and schizophrenia). The second group is personality disorders (primarily antisocial and narcissistic personality disorders). The third category includes children who have been traumatized or neglected in the family (with developing attachment disorder), or by peers.

The risk increases with a combination of the mentioned which can include all three types. However, it is possible that these are not the only types. It is important to understand that most people with psychosis have never committed murder, especially psychotic children and especially not mass murder. Most people with a personality disorder also do not fall into the category of murderers, even though most murderers do have a personality disorder. Most traumatized people don't kill anyone.

The common characteristics of all three types of school shooters are: killing rage, lack of empathy, hopelessness, helplessness, self-loathing, inadequate and fragile identity with the desire to create an image of masculinity through violence, desire for fame and excessive emotional reactivity to common peer experiences.

The school shootings most often occur in a state of acute or chronic psychological crisis.

2.   Weapons as an integral part of everyday life in the family for two generations or access to weapons;

The risk of using firearms increases if weapons are the preoccupation of one or both parents who teach the child to use weapons or give weapons as gifts to children. If society nurtures "gun culture", it can increase the risk of gun violence, including school shootings.

3.   Exposure to violent media and identification with other school shooters or killers;
Some school shooters have identified themselves with other school shooters or mass murderers exposed in the media. Videos with direct violent content or narration of violent acts are available on social networks or the darknet and can desensitize individuals to aggression and increase the likelihood of violent behavior. Ideological extremism, whether political, religious, or social, can motivate violent acts. Justifying and/or imitating the words or actions of other mass murderers is a warning sign.

4.   Combination of inheritance and environmental influences that make children vulnerable to trauma with lack of friends and social network.
The influence of the interplay of inheritance and learning is reflected in the transmission of the violent behavior of school shooter fathers across generations and the adoption of behavioral models. There is also a pattern that school shooters with psychotic and personality disorders are usually the youngest children in the family, while traumatized school shooters are usually not the youngest children.

Preventing interventions

The prevention of school shootings requires a comprehensive approach that addresses various risk factors.

1.   Open communication and good supervision of children and adolescents by parents, especially when there is an increased interest in weapons and violence;
2.   Without lying and covering up an evident problem in the child's or adolescent's behavior or mental functioning by parents or school stuff;
3.   Adequate implementation of risk assessment procedures regardless of the risk of losing the reputation of the child, parents or school; School-Based Interventions can iclude also: fostering a positive and inclusive school climate, bullying prevention programs, security measures (using metal detectors and controlled access), implementing crisis response plans to ensure prompt and effective action in case of an emergency.
4.   If an mental health evaluation by a clinician is required, then the parents should be directed to take the child for a mental health evaluation;
5.   Prevent children from having any access to firearms;
6.   Recognize possible rehearsals or simulated attacks. Pictures with weapons or pictures of only weapons may be a particular cause for concern. If there are threats (publicly or via social networks), they should be considered serious until proven otherwise. Doubts should be reported to parents or school staff. The school must have an established protocol for risk assessment.
7.   Community-Based Interventions: gun safety measures (implementing strict gun control laws and promoting responsible gun ownership), community mental health services: Ensuring access to mental health services for the entire community can help address underlying issues that may contribute to violence, media literacy education (teaching students about the impact of media violence and promoting critical thinking). Special consideration should be given to the penal policy of school and society. First, it is important to adopt and implement zero tolerance towards violence. However, in addition to suspension and expulsion from school, it is necessary to prepare measures for monitoring the suspended child. Suspensions will not prevent school shootings. Those who are on the verge of committing violence must be supervised and/or treated.

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THE ROLE OF PEDIATRIC SERVICE IN PROMOTING ORAL HEALTH

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Oral health is an essential part of general health and is fundamental for the functioning and quality of life of people, which is confirmed by numerous studies conducted worldwide in different age groups, including childhood. At the same time, it is one of the best indicators of the overall health of each person. Unfortunately, numerous epidemiological studies indicate the high frequency and pandemic character of all oral diseases, especially caries and gingival-periodontal diseases. It is estimated that 2.3 billion people worldwide have untreated caries, whereas 796 million people worldwide suffer from advanced periodontal disease. Regarding children's age, it is estimated that 532 million children have untreated caries on milk teeth, whereas the prevalence of gingivitis in children ranges from 5 to 95%, depending on the age of the examined population of children. Epidemiological data on the oral health state of children in Serbia are not optimistic either. They derive from a recently conducted cross-sectional study within the situational analysis of the "Program for Improving the Oral Health of Children and the Young". The study was conducted in 2019 and 2020 with the support of the Ministry of Health of the Republic of Serbia and the World Health Organization (WHO), following basic WHO methods for public health research on oral health and with the supervision of the WHO Collaborating Center for Epidemiology and Community Dentistry at the University of Milan, and suggested by the WHO Department of Non-Communicable Diseases in Geneva. This study determined that the frequency of caries in the nursery period amounts to 13.4%, i.e., 51.5% and 80% in the toddler and preschool period, respectively. In permanent teeth, the frequency of caries in newly erupted first permanent molars is 11.9%, whereas the frequency of caries in permanent teeth in children aged 12 amounts to 64%, i.e., 78% in children aged 15. Regarding the condition of the gingiva in children in Serbia, this cross-sectional study found that bleeding from the gingiva is present in 26% of children aged 12 and 21.6% of children aged 15. This study recorded a slight decrease in the frequency of milk teeth caries in preschool children, as well as a slight decrease in the frequency of permanent teeth caries compared to a study conducted in 2008. However, despite this, the parameters of the frequency of caries in children in Serbia are still high, which is why the prevention of caries, as well as other oral diseases, is still of key importance. Following the results of epidemiological studies conducted around the world, the WHO adopted the Global Strategy and Action Plan on Oral Health 2023-2030, which clearly highlighted the action plan for the promotion of oral health and prevention of oral diseases.

The promotion of oral health is part of general strategic measures to preserve oral health. It represents a combination of oral health education and legal, economic, environmental, organizational, and technical interventions designed to facilitate the achievement of oral health and disease prevention. Oral health promotion directs multisectoral actions on health determinants to ensure that the environment is conducive to health. The main concern is achieving health equity. Oral health promotion should be distinguished from oral disease prevention given that it represents a combination of different approaches to improving the oral health of individuals, their families, the community, and the whole population in general. Unfortunately, the ideal model of oral health promotion hasn't been developed yet, and the methodology of implementing oral health promotion is based mainly on the socio-medical approach to oral health prevention and includes the methodology of community activation, the methodology of health-educational work and the methodology of personnel education to ensure oral health. The promotion of oral health is financed from the local budget or the

budget of the Republic, and is implemented through operational, short-term, and long-term plans and goals.

The methodology of health-educational work is the most commonly used method of oral health promotion. It aims to change behavior harmful to oral health and adopt new healthy habits and includes the following population groups: pregnant women, preschool children, school children, parents of children, and finally adults. The realization of health-educational work with the mentioned groups requires the engagement of the pediatric service in the first place, followed by dentists of other specialties, gynecologists, educators, and teachers. It can be carried out independently through individual health-educational work or in counseling centers. According to current data, more than 90% of surveyed community health centers in the Republic of Serbia have counseling centers for pregnant women and preschool children. About 56% of the surveyed institutions have an oral health promotion plan, whereas 63% have a plan for the prevention of oral diseases. Promotional and preventive activities are most actively implemented within school dental care (95.3%).

Regarding oral health assessment in the pediatric population, the greatest commitment is required from the pediatric service. A recent survey conducted in the Republic of Serbia showed that pediatric dentists reported a high rate of participation in oral health education and promotion activities at the workplace and in the community. Free time and motivation are perceived as crucial factors for the quality of dentists' work. Based on the obtained results, the authors suggested that apart from systemic support, it is important for dentists to focus on further strengthening their communication skills to motivate parents and children to actively participate in maintaining oral health. In addition, the authors emphasized the importance of developing mechanisms that would contribute to achieving the appropriate balance between curative and preventive services.

However, in recent decades, the role of non-dental workers, with special emphasis on pediatricians and domiciliary care, has attracted great attention worldwide in the promotion of oral health. In this sense, the role of pediatricians is especially highlighted. It stems from parents and children's familiarity with pediatricians, who are entrusted with the care of the child's overall health from the moment of birth, as well as from frequent visits to the pediatrician, as pointed out by a myriad of authors worldwide. According to numerous studies, pediatricians around the world have a positive attitude toward oral disease prevention, and most of them believe they are responsible for the promotion of oral health and the prevention of oral diseases. However, there is currently no uniform data on their knowledge regarding the etiology of the most common oral diseases in children and their first clinical signs, legal regulations related to first dental examinations, preventive, systematic, and control dental examinations, the use of fluoride in the prevention of caries, etc. The situation is similar with educators, teachers, and other non-dental workers who are in constant contact with children, as well as with children's parents, who could play a key role in promoting and preserving the oral health of the pediatric population.

Based on everything highlighted, the role of dental and non-dental professionals within the pediatric service is of primary importance in the promotion of oral health. Therefore, constant education of all segments of the pediatric service is required through lectures, seminars, and courses on the importance and methodology of implementing oral health promotion in the pediatric population. However, in addition to the methodology of health-educational work and the methodology of personnel education for the promotion of oral health, the methodology of community activation is also of great importance. It implies active participation of all segments of the community, who would, within their competences and activities, contribute to the promotion and improvement of oral health.

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Oral presentations:

PREVALENCE OF MENTAL HEALTH IMPAIRMENT OF ADULT POPULATION IN TERITORY OF KRAGUJEVAC.

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Objectives: Mental health problems represent a significant social, medical and economic problem. Epidemiological studies indicate that the percentage of the population with mental health disorders is higher than assumed. The aim of the study was to examine the presence of the most common mental disorders (symptoms of depression, anxiety and stress) among the adult population in the territory of Kragujevac.

Materials and methods: The research was conducted as a cross-sectional study. As the research instrument we used general questionnaire to collect demographic and socioeconomic data and The Depression Anxiety Stress Scales to measure the level of depression, anxiety and stress symptoms during a period of one week before conducting the test. All statistical tests were performed using the commercial, standard software package SPSS, version 18.

Results: The survey included a total of 400 respondents. The sample consisted of 65.9% female respondents, with average age 38.3±13.5 years. A severe level of stress symptoms was present in 7.5% of men and 8.2% of women, severe level of anxiety symptoms in 3% of men and 5.4% of women, and severe level of depression symptoms in 2.1% of men and 1.3% woman, while there was no significant difference between male and female respondents.

Conclusion: The results of the research may contribute to the development of clear guidelines for solving mental health problems in the adult population, which is necessary to ensure the treatment of these patients and reduce the risk of poor quality of life and premature mortality. Mental health care must occupy a significant part of the national health policy.

Key words: depression, anxiety, stress, mental health, Serbia

CHILD MALTREATMENT REPORTED IN HEALTHCARE FACILITIES IN SERBIA 2023.

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Objectives: Child abuse means all forms of physical, emotional and/or sexual abuse, neglect or negligent treatment, commercial or other exploitation, resulting in actual or potential endangerment of a child's life, health, development or dignity within a relationship that includes responsibility, trust or power.

Materials and methods: Data analysis from 68 healthcare facilities through the online recording Public Health System.

Results: A total of 942 children were reported, regarding 980 reports of instances of abuse and/ or neglect. The higher percentage (31%) of children had been exposed to abuse and/or neglect was in the age of 12-14 years. Physical abuse was suffered by 80% of children, emotional abuse by 21%, and every tenth child suffered sexual abuse (9%). 11% of children were exposed to domestic violence, and 3% to digital violence.

From a total of 229 reports of neglect, the largest percentage of children suffered physical neglect (57.6%), followed by educational (36.2%) and medical (34.6%), and one in seven suffered emotional neglect (11.8%).

The most common abuser, for all types of abuse are peers, parents and known person from the child's environment.

Conclusion: Protective measures should, as necessary, include effective programs to prevent abuse or, when abuse has already occurred, effective programs to support the child and the family, as well as adequate treatment of the abuser.

Key words: Child abuse, healthcare facilities

SOCIO-DEMOGRAPHIC DETERMINANTS OF MULTIPLE RISK BEHAVIORS AMONG HIGH SCHOOL STUDENTS IN SERBIA.

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Objectives: This study examined the relationships between demographic characteristics and socio-economic status and engaging in multiple risk behaviors among adolescents in the Republic of Serbia.

Materials and methods: A secondary analysis is performed on the original data of the 2021/22 HBSC study, which was conducted on 1479 students in a nationally representative sample of high schools in Serbia. A multivariate logistic regression analysis compared no risk behaviors with two or more risk behaviors.

Results: A multivariate logistic regression revealed that individuals living in an incomplete family are nearly twice as likely (OR = 1.867) to engage in two or more risky behaviors compared to those not engaging in any. Furthermore, secondary vocational school students have a two-fold higher chance (OR = 1.572) of engaging in multiple risky behaviors than those not engaging in any.

Conclusion: The study's findings will be utilized to develop health education programs that aim to prevent risky behaviors and encourage responsible actions regarding the health of this vulnerable population.

Key words: Risk-taking, Socioeconomic factors, Demographic factors, Adolescent

THE PREVALENCE OF CYBERBULLYING AMONG SCHOOL-AGED CHILDREN IN SERBIA.

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Objectives: Cyberbullying is becoming a growing problem among school-age children in Serbia. This study aimed to examine the prevalence and exposure of cyberbullying in a sample of school children aged 11, 13 and 15 years.

Methods: A secondary analysis is performed on the original data of the 2021/22 HBSC study, which was conducted on 3,713 students in a nationally representative sample of primary and high schools in Serbia.

Results: The results of the survey show that 14.1% of students were once or more exposed to some type of cyberbullying in the last few months. Girls in the 7th grade of elementary school were exposed to some form of cyberbullying more often than once a week. Girls were exposed to cyberbullying twice as much as boys. Students in the 5th grade of elementary school more often abuse other students with some form of digital violence, more often boys than girls.

Conclusion: Exposure to cyberbullying was more common among girls than among school-age boys. Children in the 7th grade of elementary school are most often abused by some form of cyberbullying. Primary prevention of all forms of violence against children is a priority.

Keywords: cyberbullying, prevalence, exposure, school-aged children, Serbia

PROMOTION OF MENSTRUAL HEALTH AND PREVENTION OF MENSTRUAL POVERTY AND STIGMA.

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Objectives: Menstrual health is the basic right of every girl and woman of reproductive age and has an impact on the entire society. It implies access to accurate information about the menstrual cycle, menstruation and changes experienced throughout the life course, as well as related self-care and hygiene practices. A lack of knowledge about menstrual hygiene affects many young women around the world, resulting in a low level of awareness of the importance of menstrual health.

Materials and methods: An overview of existing global research and programs for the promotion of menstrual health, as well as an assessment of the possibility of applying similar education models to our healthcare system.

Results: Raising awareness through education programs can contribute to women better understanding their menstrual cycle, to know what to expect and what is normal and what is abnormal in certain phases of the menstrual cycle, to recognize different symptoms that indicate certain disorders in the menstrual cycle and to know how to properly use the means for maintaining menstrual hygiene. This kind of empowerment of young women can lead to the prevention of various negative health outcomes and complications related to menstrual health.

Conclusion: Girls and young women require special attention since they are the most vulnerable group, not only in terms of their social status, but also in relation to their health. Poor menstrual hygiene and menstrual poverty can lead to the development of various health complications, which can have a long-term impact on a woman's reproductive health.

Key words: reproductive health, menstrual health, menstrual poverty

ASSOCIATION BETWEEN KNOWLEDGE AND THE DECISION TO GET VACCINATED AGAINST HPV AMONG FEMALE AND MALE UNDERGRADUATE STUDENTS IN BELGRADE.

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Objectives: To evaluate the association between knowledge about human papillomavirus (HPV) and the decision to get vaccinated against HPV among female and male undergraduate students in Belgrade.

Materials and methods: Male and female undergraduate students aged 19-26 from the Institute for the Health Protection of Students of Belgrade were surveyed. Participants included those receiving their second dose of the nonavalent HPV vaccine and those accessing general healthcare services. An online survey, hosted on the secure servers of the Faculty of Medicine, University of Belgrade, collected data on HPV vaccination status, socio-demographic characteristics, information sources, trust in these sources, perceived information adequacy, and HPV knowledge. Ethical approval was obtained from the relevant committees, and statistical analyses were performed using SPSS and R software.

Results: Six hundred and three students filled the survey completely, including 494 females and 109 males. 78.6% of participants were vaccinated, with females having a higher vaccination rate (82%) compared to males (63.3%). Among vaccinated students, 90.9% correctly identified that the HPV vaccine protects against cancer-causing strains of the virus, compared to only 57.4% of unvaccinated students. Additionally, 80.6% of vaccinated individuals correctly understood that the vaccine is effective even if received after the first sexual encounter, whereas only 46.5% of unvaccinated participants held this belief. Notably, 95.1% of vaccinated participants knew that the vaccine is not only for females, while only 69.8% of unvaccinated students were aware of this. Furthermore, 91.4% of vaccinated students recognized that oncogenic strains of HPV can cause various cancers, compared to 68.2% of unvaccinated students. The overall knowledge score was significantly higher among vaccinated participants, highlighting the strong correlation between knowledge and vaccination status.

Conclusion: The study demonstrates a clear association between higher levels of knowledge about HPV and its vaccine and the likelihood of being vaccinated. Vaccinated students consistently showed better understanding of critical facts about the HPV vaccine's efficacy, its relevance to both genders, and its role in preventing various cancers. These findings underscore the importance of comprehensive, accurate information dissemination as a strategy to combat HPV-related cancers through improved vaccine coverage.

Key words: HPV vaccination, information environment, trust, knowledge, behavior change

AN EXAMPLE OF A LARGE PREVENTIVE ACTION IN THE "STUDENT CITY" IN BELGRADE, ON THE BELGRADE UNIVERSITY STUDENTS' DAY.

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The Institute for Student Healthcare Belgrade has been celebrating Students' Day for many years. This year it was celebrated on April 4, 2024. in the student dormitory "Studentski grad".

Objectives: to show how the teams of doctors and nurses can offer medical services to students in the places where they live, so that students can get numerous advices and preventive examinations as easily as possible.

Method: in the largest student dormitory in Belgrade - "Student City", where about 4000 students live in one place, in the afternoon and evening hours students are offered: measurement of sugar level, measurement of body fat percentage, BMI, HIV testing, spirometry, pressure measurement, dermatologist examinations, gynecologist advice, epidemiologist advice and general advice related to a healthy life.

Results: During this action, 398 preventive examinations and services were performed: 34 spirometry, 55 blood sugar levels, 43 advice on reproductive health, 65 questions related to vaccination, 68 blood pressure measurements, 30 dermatological examinations, 48 fat measurements and BMI, 29 counseling regarding STD , 26 testing for HIV.

Conclusion: The preventive action took place in an extremely friendly   atmosphere. Such a large response of students and their interest, show the necessity of organizing such public health activities for students and generally for young people as often as possible.

Key words: preventive actions, students, Students' Day

CHALLENGES IN HEALTH EDUCATION OF SCHOOL CHILDREN.

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Objectives: Since 2010. Year, Health education in schools in Serbia has been implemented through two programs developed on the national level (programs for primary and secondary schools), considering that Serbia was not associate of the Health Promoting Schools (HPS) program. The objective of the study was to identify general challenges of programs, the providers face up, and define recommendations for further work in the field of Health education of school children in Serbia.

Methodology: In order to understand the problem, an analysis of health-educational programs, intended for children of primary and secondary schools, was carried out through analysis of reports on Health education for primary and secondary schools, as well review of all relevant national and international documents.

Results and discussion: Cooperation between governmental institutions is the biggest strength of analyzed programs; programs are lacking the character of community based and accepted programs, as well inter-sectoral and inter-organizational partnerships at all levels in the community.

Conclusion: Standards and good practice guidelines are needed; those developed through Health Promoting Schools (HPS) program could be practiced.

Key words: Health education, children, schools

Poster presentations:

COMPARATIVE ANALYSIS OF MEDICAL AND NON-MEDICAL STUDENTS' ATTITUDES TOWARDS URINARY TRACT INFECTION PREVENTION.

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Objectives: To compare medical and non-medical students' attitudes on preventing urinary tract infections (UTIs).

Materials and methods: A cross-sectional prospective survey using a specially designed questionnaire was conducted in February 2024.

Results: A total of 177 female students participated, with slightly more than half (55.9%) having formal medical education. The average age was 22.5 ± 2.1 years, and 9.6% had chronic diseases. Most respondents knew that optimal water intake (88.1%) and urological teas (68.4%) prevent UTIs, while carbonated beverages and juices (70.0%) negatively impact UTI prevention. Frequent bladder emptying (81.9%) and proper intimate hygiene (94.9%) were also recognized as preventive measures. There was no statistically significant difference in these views between medical and non-medical students. However, medical students (74.7%) more often believed that using public toilets increases UTI risk compared to non-medical students (62.8%), showing a significant difference ($p<0.05$). Additionally, a higher percentage of medical students (89.9%) compared to non-medical students (69.2%) believed that diabetes and other immune-compromising diseases increase UTI risk, another significant difference ($p<0.05$).

Conclusion: Students generally have adequate attitudes about UTI prevention but some gaps remain. The high prevalence of UTIs highlights the need for improved education on prevention, with these findings potentially guiding future educational campaigns targeting students from various faculties.

Key words: Attitude, Prevention, Student, Urinary Tract Infection

EVALUATION OF DIGITAL HABITS AND THEIR IMPACT ON SPORT-ORIENTED YOUTH POPULATION.

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Objectives: Social networks have caused profound changes in the habits of youth population. The aim of the study was to evaluate digital habits and their impact on sport-oriented children and adolescents between the ages of 7 and 19.

Materials and methods: A prospective, cross-sectional study was conducted at the Judo club, among 119 participants who train at least two times a week, between June and September 2022.

Results: Most sport-oriented children and adolescents (52.1%) spend their free time outside on weekends and working days, and use social networks rarely or not at all (59.7%). However, the use of social networks becomes more significant as they turn 12 years (p<0.001). Instagram (49.4%) and TikTok (30.6%) are the most popular applications in this population, with a significant difference between different age groups (p<0.001). Children older than 12 years are more likely to be using Instagram (59.7%) compared to those younger than 12 years who use TikTok (58.3%). Nearly all (96.4%) stated they don't believe the content on social networks.

Conclusion: This study concludes that children and adolescents who practice sports on a regular basis use less social networks and are less influenced by them. This indicates that sport could promote healthier digital habits in youth population.

Key words: health promotion, sport, youth population, digital habits, social networks

WHAT SURPRISES DID THE TWO-YEAR "PILOT MODEL" OF PREP USING, REVEALED IN THE INSTITUTE FOR STUDENTS' HEALTH OF BELGRADE UNIVERSITY?

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[1]Institute for Students' Health of Belgrade University

Objectives: Many countries have developed their own national PrEP guidelines for high-risk populations, but there are still countries without national guidelines and our country is one of them. In those countries, PrEP is usually obtained on the black market.

Materials and methods: a retrospective study included clients of the Institute for Students' Health of Belgrade University AIDS Counseling Center who have used PrEP for 2 years (May 1, 2022 - April 30, 2024). All clients have performed a set of at least 5 tests every 3 months as a minimum of diagnostics that are necessary to prescribe a PrEP purchase report: HIV test (Ag/Ab test), HBsAg, anti-HCV, syphilis Antibody (Ab), and blood creatinine level.

Results: 197 clients received PrEP prophylaxis through the Counseling Center. 36 (18%) of them were referred to specialists due to irregular findings. The largest number 23 (12%) were referred for further diagnosis and treatment due to detected syphilis, 6 (3%) due to gonorrhea, 4 (2%) due to problems with high creatinine values, and 2 (1%) due to other metabolic disorders patient. The largest number of users had syphilis due to "old" infections, while 5 users (2.5%) were infected with syphilis during the use of PrEP.

Conclusion: The importance of this data points out the need to raise awareness among healthcare workers about the presence of a high percentage of syphilis infection among the MSM population.

Key words: PrEP, MSM, syphilis

SESSION: APPLICATION OF INFORMATION AND COMMUNICATION TOOLS IN THE HEALTHCARE SYSTEM

INVITED LECTURE

USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE MEDICAL STUDENTS EDUCATION

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Abstract: The integration of Information and Communication (IC) technologies has significantly impacted education, particularly in the field of medicine. Recent advancements have made IC resources widely available, supporting both traditional and online learning. This research emphasizes the importance of assessing students' knowledge and attitudes towards these technologies for successful implementation. Mobile devices, such as smartphones and tablets, have further enabled continuous access to educational materials, promoting a new form of learning. In the medical field, student success now largely depends on acquiring IC technology skills. Continuous education and staying updated with the latest information have become essential due to the ever-evolving nature of clinical practice. Traditional methods of medical education require substantial time and resources, prompting the adoption of hybrid teaching models. These models combine traditional and online activities, allowing students to learn at their own pace. The study conducted at the Faculty of Medicine, University of Belgrade, evaluated medical students' knowledge and attitudes towards IC technologies. The majority of students recognized the importance of informatics in medical education and practice. Computer literacy and internet use were positively associated with attitudes toward IC technologies. The research highlights the potential of IC systems, such as distance learning platforms use in medical education. These findings provide a basis for strategic planning, aligning future doctors' competencies with workplace needs and continuous professional development.

Keywords: education, information and communication technologies, medicine, online, hybrid learning

USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE MEDICAL STUDENTS EDUCATION

The progress of modern society, driven by technological development, has led to significant changes in education [1,2]. Information and communication (IC) resources have become widely available, supporting both traditional and online learning environments [2,3]. For the successful implementation of modern IC technologies, it is equally important to assess students' knowledge and their attitudes towards the use of these technologies [4–6]. In recent years, mobile and portable devices with internet connectivity, such as smartphones and tablets, have become widely used among students. Mobile technologies have enabled a new form of learning, where students have instant and continuous access to educational materials [7–9].

Student success in a technologically advanced educational environment largely depends on acquiring skills that involve the use of IC technologies, particularly in the field of medicine [1,10,11]. The need to stay updated with the latest information has become a daily challenge, while constant change has become the norm in everyday clinical practice. Continuous education, as a pursuit of self-improvement, professional sustainability, competitiveness, and advancement, has gained exceptional importance in medicine. The introduction of new IC technologies has changed the way we access information, collaborate, and communicate, making research on the application of these technologies indispensable for improving the educational process [1,3].

Traditional methods of medical education require significant time resources from both teachers and students. To optimize the management of time and space resources, innovative methods are being introduced into the learning process. Hybrid teaching, oriented towards personalized learning, is increasingly being integrated into medical curricula [1,12,13]. Traditional teaching is combined with activities moved to an online environment, allowing students to engage in these activities at times that suit them best.

Specific knowledge has become essential for evaluating the quality of medical information collected in everyday practice, while the ability to gather information from specialized knowledge databases has become a prerequisite for medical practice. However, access to modern IC technological tools depends on the skills individuals possess in using them. The advent of Web services has significantly eased access to materials and information [14,15]. Nevertheless, flexibility is required from both institutions and students to implement new forms of education and keep pace with their frequent changes. It is crucial to find a balance between the maximum potential that new IC technologies offer and their practical applicability in existing curricula.

Online teaching contributes to enhancing traditional education but becomes indispensable in emergency situations, such as epidemics, pandemics, and natural disasters. These situations bring new challenges but also unique opportunities to introduce technological innovations in medical education [16]. During states of emergency caused by epidemics, restrictions are imposed on physical contact between teachers, students, and patients. The COVID-19 pandemic posed immense challenges to healthcare systems worldwide, with equally severe consequences for healthcare delivery and medical education [17]. Epidemics have unexpected impacts on the educational system, including the suspension of classes and exams, and may even lead to the closure of medical schools [18]. Such situations can also result in lasting changes in the way doctors are educated [16]. For these reasons, medical schools have begun to adapt to pandemic conditions by strengthening their capacities for consultations, teaching, and examinations in rapidly developing digital environments [19].

This research focused on identifying factors associated with the acceptance of IC technologies, as well as developing and adapting new solutions for teaching, particularly in

the field of medicine. Conducted at the Department of Medical Statistics and Informatics, Faculty of Medicine, University of Belgrade, the study was a prospective cohort study involving two consecutive generations of first-year medical students (n=1,110). The research assessed medical students' attitudes towards IC technologies, their existing knowledge, and their prior use of these technologies in education and work, using an anonymous questionnaire. The questionnaire covered demographic data, self-assessment of IC technology knowledge and computer skills, previous experience with IC systems, and attitudes towards the use of IC technologies in daily life and education.

As part of the research, an educational program titled "Application of Information and Communication Technologies in Medicine" was developed, implemented, and evaluated. The program aimed to equip medical students with competencies in IC technologies necessary for their future careers and for online education. It was delivered using a hybrid learning model, combining traditional and online learning environments. A smaller proportion of students (19%) had prior experience with various forms of online learning. The majority of students agreed that informatics is essential in medical education and that it is useful in medical practice (4.1 ± 1.0 and 4.1 ± 0.9, respectively).

Computer literacy and the use of the Internet in education were significantly related to positive attitudes toward IC technologies, as shown by an adjusted multivariate regression model. More than 80% of students reported that they learned how to evaluate medical information and that they plan to use the Internet to search for scientific research papers as additional learning material in the future. Most students (77%) agreed that the hybrid learning model, which combines traditional and online learning, provides better access to materials and allows them to study at times that suit them best (72%).

The research also systematically presented the potential of IC systems in conducting online classes and analyzed the systems implemented at the Faculty of Medicine, University of Belgrade. The selection of specific technological solutions and their integration into a cohesive system was justified. Moodle LMS was used as a support system for distance learning, enabling the management of teaching materials and activities in an online environment, as well as monitoring and analyzing user activities. Student activities were monitored and permanently recorded, including access to teaching materials and evaluation of their work according to predefined criteria. The BigBlueButton teleconference system, integrated within the Moodle portal, facilitated the delivery of practical skills remotely and enabled direct interaction and discussion between students and lecturers. These systems also supported the introduction of video transmissions, video recordings, photo galleries, and links to other educational materials.

The results of this research can serve as a foundation for strategic planning in the development of medical higher education institutions, with the aim of aligning the competencies of future doctors with the needs of their workplaces, continuous education, and scientific research.

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INVITED LECTURE

PSYCHOMETRIC PROPERTIES IN INSTRUMENTS EVALUATION

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Abstract: The main psychometric properties of a questionnaire are its reliability and validity. The reliability of a questionnaire refers to the degree to which it will produce consistent results. Internal consistency of the questionnaire refers to the extent to which the items that measure the same concept are directly related to one another. To assess the internal consistency of a questionnaire, several reliability coefficients are employed, including Cronbach's alpha coefficient, Split-half measures, Intraclass correlation coefficient, and Kuder-Richardson Formula 20 (for dichotomous responses). Generally, questionnaires are considered to have an acceptable level of internal consistency when their reliability coefficients are ≥0.7. Test-retest reliability refers to the evaluation of the consistency of measurement outcomes over time. Inter-rater reliability is used to assess the level of agreement between measurement results obtained by different evaluators. The validity of a questionnaire refers to the extent to which an instrument measure what is intended to measure. Content validity refers to the extent to which the construct is covered, and whether the questions in the questionnaire are representative of the construct being studied. Criterion validity assesses the validity of the questionnaire in relation to external criteria. Construct validity evaluates the extent to which a questionnaire measures the construct it was designed to measure. Factor analysis is most commonly used to assess the construct validity of a questionnaire. Exploratory Factor Analysis (EFA) examines and summarizes the correlation structure of an existing dataset, while Confirmatory Factor Analysis (CFA) tests the correlation structure of the dataset against a presumed structure and measures the level of fit.

Keywords: questionnaires, cultural adaptation, psychometric properties, reliability, validity

PSYCHOMETRIC PROPERTIES IN INSTRUMENTS EVALUATION

Questionnaires serve as tools for data collection in survey research. Furthermore, apart from the option of creating questionnaires, researchers frequently engage in the adoption and utilization of questionnaires that have already undergone validation on different populations of participants. The initial stage in implementing these questionnaires involves acquiring permission from the original questionnaire author for its translation and utilization. The process of translating a questionnaire may occasionally require the modification of the questions to align with the particular attributes of the participants or the research settings in which it will be implemented. The International Methodological Guidelines for the Translation and Cultural Adaptation of Questionnaires outline the sequential procedures involved in the translation and cultural adaptation of original questionnaires:

- Forward translation is the process of translating a questionnaire from its original language to the language used for a study conducted by two separate expert translators.
- The consolidation process involves combining the translations into a unified version of the questionnaire.
- Backward translation refers to the process of translating from the language used for research purposes back into the original language utilized for the questionnaire.
- A team of experts thoroughly evaluates the translations in comparison to the original version. The questionnaire is revised as necessary to eliminate any discrepancies that alter the meaning of the questions and/or the provided answers. A pre-final version of the questionnaire is then generated.
- Testing the questionnaire by administering it to a limited number of participants in order to assess the interpretation, clarity, and comprehension of the questions.
- Completing any required revisions and creating the definitive version of the translated questionnaire.

Assessment of the Questionnaire's Psychometric Properties

The main psychometric properties of a questionnaire are its reliability and validity. The **reliability** of a questionnaire refers to the degree to which it will produce consistent results.

Internal consistency of the questionnaire refers to the extent to which the items that measure the same concept are directly related to one another. To assess the internal consistency of a questionnaire, several reliability coefficients are employed, including Cronbach's alpha coefficient, Split-half measures, Intraclass correlation coefficient, and Kuder-Richardson Formula 20 (for dichotomous responses). The reliability coefficients range from 0 to 1, where values close to 1 indicate a high level of test reliability. Generally, questionnaires are considered to have an acceptable level of internal consistency when their reliability coefficients are ≥0.7.

Test-retest reliability refers to the evaluation of the consistency of measurement outcomes, specifically whether the answers to identical questions in a questionnaire remain unaltered in participants whose condition has not undergone any changes over time. The standard measure for evaluating the test-retest reliability of continuous variables is the Intraclass Correlation Coefficient (ICC), which is considered acceptable when it exceeds 0.7. The Kappa (κ) coefficient is used for dichotomous variables, where values of κ greater than 0.6 signify the good agreement of the data.

Inter-rater reliability is used to assess the level of agreement between measurement results obtained by different evaluators. The inter-rater reliability of a questionnaire can be assessed

by employing Kappa statistics to evaluate the agreement of categorical data, and Pearson's linear correlation coefficient to evaluate the agreement of numerical data.

Parallel Forms Reliability (Equivalent Forms) is used to evaluate the consistency of test results when different versions or forms of the same questionnaire are used. This approach involves creating a parallel version of the questionnaire that is identical to the original one, but with different question formats. Both versions of the questionnaire are administered to collect the sample data during the survey, and their reliability is evaluated by calculating correlation coefficients.

The **validity** of a questionnaire refers to the extent to which an instrument measure what is intended to measure. There are several types of validity: content validity, criterion validity, and construct validity.

Content validity refers to the extent to which the construct is covered, and whether the questions in the questionnaire are representative of the construct being studied. Assessing this type of validity is crucial during the questionnaire design phase.

Criterion validity assesses the validity of the questionnaire in relation to external criteria. There are two types of criterion validity: concurrent validity and predictive validity. Concurrent validity refers to the correlation between measurement results and data obtained using a comparable questionnaire, which serves as a quality standard and is considered to reflect true results. Correlation coefficients (r) are used to assess concurrent validity. A strong correlation exists if r > 0.5, a moderate correlation if r ≥ 0.3, and a weak or mild correlation if r < 0.3. Predictive validity examines how well the measurement result obtained using the questionnaire predicts another related characteristic.

Construct validity evaluates the extent to which a questionnaire measures the construct it was designed to measure, and is applied when there is no adequate gold standard or other accuracy criteria. Factor analysis is most commonly used to assess the construct validity of a questionnaire, and it examines correlations between variables in order to identify homogeneous groups of variables, known as factors. Exploratory Factor Analysis (EFA) examines and summarizes the correlation structure of an existing dataset, while Confirmatory Factor Analysis (CFA) tests the correlation structure of the dataset against a presumed structure and measures the level of fit. In EFA the aim is to categorize strongly correlated items into domains or factors, in order to determine the number of domains in the questionnaire. Factors are typically extracted using Principal Component Analysis, based on Kaiser's criterion (eigenvalue greater than 1), followed by appropriate factor rotation (varimax, quartimax, equamax) to minimize the simultaneous association of variables with multiple factors, thereby improving the interpretability of the resulting model. CFA is used to confirm the original structure of a questionnaire. The aim of CFA is to examine the fit of the items and domains to the presumed (original) structure of the questionnaire using fit indices. Absolute fit indices (Chi-square test, Root Mean Square Error of Approximation (RMSEA), Goodness-of-fit Statistic (GFI), Adjusted Goodness-of-fit Statistic (AGFI), Root Mean Square Residual (RMR), etc.) are used to select the model with the best fit. Multiple indices are often examined simultaneously. Although frequently used, a limitation of the Chi-square test is that its value depends on the sample size, which can sometimes lead to incorrect conclusions (larger values support rejecting the null hypothesis), so some authors use the relative/normed Chi-square test. The RMSEA index favors models with a smaller number of domains; RMSEA values less than 0.08 indicate a model with a good fit. The GFI and AGFI fit indices also depend on the sample size, so they are rarely used when evaluating a model. Comparative or incremental fit indices compare the selected model with a presumed model; values close to 1 indicate a better model. This group of indices includes: Normed Fit Index (NFI), Tucker Lewis Index or Non-normed Fit Index (TLI or NNFI), Bentler's Comparative Fit Index (CFI), Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC),

and Sample Size Adjusted Bayesian Information Criterion (SABIC). The level of fit is generally considered acceptable if the values of these indices are greater than 0.9.

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CHATGPT FOR MEDICAL EDUCATION: POTENTIAL IMPACT AND OPPORTUNITIES

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Abstract:

Applying artificial intelligence (AI) in medical education may further facilitate learning and training. ChatGPT seems to impact medical education inevitably. The AI tool could be used to assist medical students, educators, and healthcare professionals in fulfilling their roles at all levels. Also, AI tools might be a way to improve both efficacy and quality of education. ChatGPT could help adapt learning materials and lesson plans to meet each individual's need, then give immediate feedback, provide teaching materials with interactive content such as quizzes and tests, and write adaptive courses directly proportional to an individual's progress. ChatGPT can help improve student learning outcomes and engagement by providing personalized educational materials and task recommendations. Also, ChatGPT could provide engaging case studies that are realistic in clinical practice, thus allowing students to enhance their clinical reasoning and decision-making skills through practice and immediate feedback. Therefore, specific opportunities of ChatGPT in medical education have been recognized, such as bridging gaps in access to education, enhancing collaborative learning, innovation in medical training, and supporting lifelong learning and professional development. ChatGPT is gaining popularity in the medical education field, yet it is accompanied by several difficulties, such as accuracy and reliability, ethical and privacy concerns, integration with existing curriculum, ethical use and responsibility, technological infrastructure and accessibility. Achieving consistency, resolving ethical issues, aligning with educational standards, and eliminating technological restraints could be possible steps to unleash AI in medical education.

Keywords: artificial intelligence, ChatGPT, education, students

Introduction

The application of artificial intelligence (AI) in medical education further facilitates learning and training. ChatGPT seems to inevitably impact medical education (Xu, Chen, & Miao, 2024). The AI tool could be used to assist medical students, educators, and healthcare professionals in fulfilling their roles at all levels. Also, AI tools might be a way to improve both efficacy and quality of education.

Student-facing and teacher-facing ChatGPT applications

Several student-facing use cases of ChatGPT in education and healthcare are described below (Figure 1). In personalized education, ChatGPT could help adapt learning materials and lesson plans to meet each individual's need, then give immediate feedback, provide teaching materials with interactive content such quizzes and tests, and write adaptive courses directly proportional to an individual's progression (Ray, 2023). The ChatGPT will be able to provide specified suggestions based on an analysis of information related to successful teaching strategies and students' performances (Kasneci et al., 2023; Tlili et al., 2023).
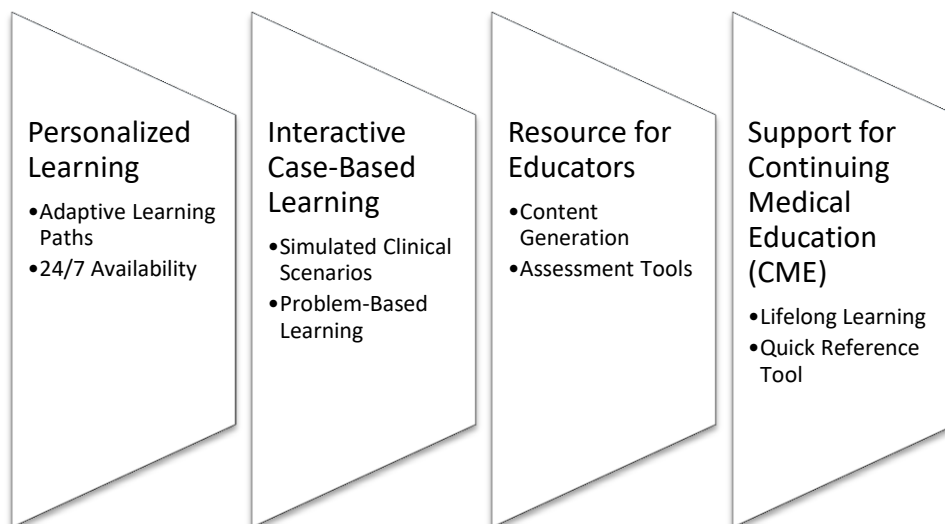
Personalized Learning	Interactive Case-Based Learning	Resource for Educators	Support for Continuing Medical Education (CME)
•Adaptive Learning Paths •24/7 Availability	•Simulated Clinical Scenarios •Problem-Based Learning	•Content Generation •Assessment Tools	•Lifelong Learning •Quick Reference Tool

Figure 1. Potential Impact of ChatGPT on Education

The academic system could supplement personalized learning by analyzing what students excel at and their challenges and tailoring each individual course accordingly using ChatGPT. Personalization allows learners to focus on areas they most need improvement (Ayub, Hamann, Hamann, & Davis, 2023). Also, it may support educators through lesson plans, teaching methodologies, and classroom management. ChatGPT is useful for test preparation through personalized feedback on test materials, approaches towards the test, and practice exams. ChatGPT can also make personalized recommendations for students based on past exam performance and study behaviour, which can help them prepare for tests better (Tlili et al., 2023). Moreover, studies show that adopting ChatGPT during learning motivates students (Ali, Shamsan, Hezam, & Mohammed, 2023).

ChatGPT also has the potential to help improve online tutoring by analyzing data on students to recommend individualized tutoring that best suits their learning needs. By allowing personalized tutoring that respects students' learning styles, ChatGPT improves academic performance and increases student engagement. The AI offers constant support, meaning

students can always get knowledge and feedback from this tool, promoting continuous learning outside the traditional classroom setting. Students can engage with artificial intelligence at any time, which allows for the retrieval of information and assistance, thereby promoting ongoing education outside the limitations of conventional educational settings (Pardos & Bhandari, 2023). Also, it can offer personalized advice on grammar, vocabulary, and pronunciation to improve language learning. Through an analysis of student data, ChatGPT tailors recommendations to aid in language skill improvement (Rudolph, Tan, & Tan, 2023).

As a confirmation of this potential (Figure 2), ChatGPT passed three exams of the United States Medical Licensing Examination (Tiffany H. Kung et al., 2023). ChatGPT achieved success in a more demanding postgraduate test focused on fundamental cardiology knowledge, namely the European Exam in Core Cardiology (Skalidis et al., 2023). It was observed that ChatGPT displayed a proficient comprehension of statistical principles based on citation (AL-Qadri & Ahmed, 2023). Evidence indicates that this chatbot is capable of achieving a passing score on the licensing examination without human input (Tiffany H Kung et al., 2023).

Secondly, ChatGPT could provide engaging case studies that are realistic in clinical practice, thus allowing students to enhance their clinical reasoning and decision-making skills through practice and immediate feedback. In addition, the AI could guide students through problem-based learning exercises. This encourages critical thinking and deeper insight into complex medical cases (Giunti, Garavaglia, Giuntini, Pinna, & Sergioli, 2023). Additionally, ChatGPT could act very successfully in continuing education for health professionals by updating knowledge on the most recent medical research and guidelines. In clinical practice, ChatGPT could be valuable as a quick reference guide by offering evidence-based data that may assist in making decisions.

Delivering culturally appropriate content in different languages also widens access to quality medical education. The ease of access to medical education for students living in such areas is an added advantage because everyone can use ChatGPT. There, it can take the form of training support, including textbooks on various subjects or software applications that students can use outside traditional classroom settings to enhance their learning process. In this regard, attempts to harness conversational agents, such as ChatGPT better, face several challenges: students generally use local literature due to the lack of adequate translation, there is seldom a global approach in pedagogy and curriculum, and students often struggle to identify quality sources. This tool can serve as a learning companion and provide peer-to-peer and on-demand learning (Xu et al., 2024). Chatbot assists self-regulated learning with the help of online pedagogical resources and allows

Specific opportunities of ChatGPT in medical education can be summed up as follows: bridging gaps in access to education, enhancing collaborative learning, innovation in medical training, and supporting lifelong learning and professional development (Baidoo-anu & Owusu Ansah, 2023) (Figure 2).
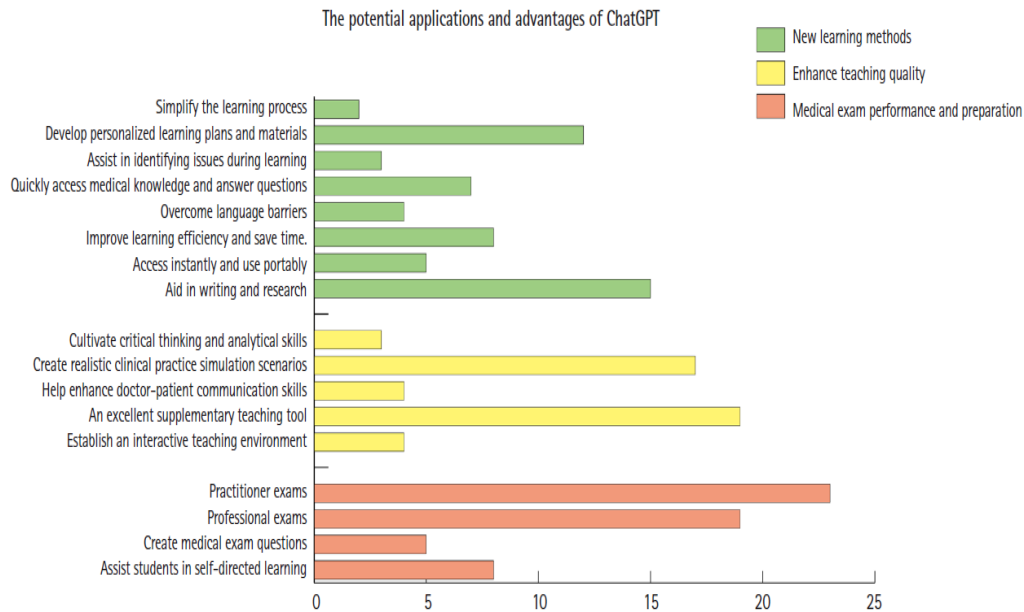
Figure 2. Summary of potential applications and advantages of ChatGPT (Source: Xu et al. (Xu et al., 2024))

Challenges in ChatGPT applications

ChatGPT is gaining popularity in the medical education field, yet it is accompanied by several difficulties, such as accuracy and reliability, ethical and privacy concerns, integration with existing curriculum, ethical use and responsibility, technological infrastructure and accessibility. Based on many responses, it was reported that ChatGPT can solve most of the problems, but the accuracy drops relatively greater for more demanding and pragmatic tasks (Kocoń et al., 2023). Challenges in ChatGPT applications have been documented in simple calculations (Dao & Le, 2023), solving biostatistical problems (Ignjatović & Stevanović, 2023), and parasitology (Huh, 2023). Systematic reviews highlight concerns about their accuracy and reproducibility, which may lead to the dissemination of false data, misinformation, and incorrect interpretations of medical terms. These inaccuracies, known as hallucinations, might seem scientifically reasonable (Deng & Lin, 2022). In addition, it was observed that ChatGPT's behaviour could vary within a brief timeframe. Previous research (Chen, Zaharia, & Zou, 2023; Deng & Lin, 2022) has proven that ChatGPT's need for human judgment stems from its shortcomings in critical thinking, generation accuracy, and critical assessment skills. One of the significant challenges is ensuring that ChatGPT provides accurate and current information. Regular updates with the latest research findings, clinical guidelines, and medical advancements are essential to maintaining reliability.

ChatGPT offers significant opportunities to revolutionize medical education by enhancing learning through personalized, interactive, and accessible content. However, these opportunities come with challenges that must be carefully managed. Ensuring accuracy, addressing ethical concerns, aligning with educational standards, and overcoming technological barriers are essential steps in realizing the full potential of AI in medical education. AI tools like ChatGPT could play a transformative role in training the next generation of healthcare professionals as the field evolves. Based on the evidence, ChatGPT may strongly support education, allowing educators additional time and opportunities to work and develop students' criticism.

ChatGPT: This is a golden chance to reform medical education by making learning better imparted, personalized and interactive. However, along with these potentialities, the issues they present to be carefully and predictably addressed. Possible steps to unleash AI in medical education might include achieving consistency, resolving ethical issues, Aligning with educational standards, and eliminating technological restraints. AI tools such as ChatGPT may be transformational in training future healthcare professionals parallel to healthcare evolution. The evidence suggests that it could greatly assist education, giving teachers more time to focus on creating other activities and furthering students' critical thinking.

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ORAL PRESENTATIONS

REDISTRIBUTION OF GARBAGE CODES USING ANACONDA SOFTWARE

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Abstract

Objective: Redistribution represents the conversion of garbage codes (GC) into one of the three main Global Burden of Disease (GBD) groups (infectious diseases, non-infectious diseases or external causes).

Methods: The redistribution algorithm implemented in the ANACONDA program is identical to that used in the GBD study. It is based on clinical and pathophysiological observations and opinions on possible misdiagnoses, statistical algorithms, and proportional redistribution according to the underlying cause of death (UCD) pattern assessments. The target population is the database of deceased persons in Serbia from 2005 to 2019.

Results: After GC redistribution, 39.1% were reclassified as non-infectious diseases, 0.1% as infectious diseases, and 2.5% as external causes. In females, 18% of GCs were reclassified to Cardiomyopathy and Myocarditis, the first-ranked category after redistribution that was not among the leading UCD before redistribution. Among males, after the redistribution, the category Alcohol use disorders appeared among the first 20 leading diseases with 0.7%, which was not among the leading diagnoses before the redistribution.

Conclusion: Due to the ANACONDA analysis, 9.2% of GC in females and 9.1% of GC in males were successfully redistributed.

Keywords: garbage codes, redistribution, ANACONDA software, Serbia

PREFERRED MODERN CHANNELS OF COMMUNICATION AMONG FEMALE PATIENTS

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Objectives: The aim of this paper is to determine the preferred way of communication of the respondents with the health system and the presence of motivation to use any telemedicine modality for the purpose of improving health literacy and more effective prevention of cardiovascular diseases among women.

Materials and methods: The research was conducted in the UKCS Cardiology Clinic from 01.01.-31.01.2023 among women hospitalised in all the clinic's departments, including the day hospital. The questionnaire included a survey on knowledge of classic and modern risk factors for CVDs, preferred methods of communication with the health system, basic causes of hospitalisation, and anthropometry data.

Results: Our examined group showed the expected level of motivation for different communication modalities as part of further follow-up. Phone calls and SMS messages dominate as the preferred way of communication. There is a low level of willingness to use social networks for health education purposes. Respondents show an almost uniform level of trust towards senior doctors, junior doctors, and nurses.

Conclusion: It is necessary to present an already globally accepted concept of Women's Heart Centers - which teach women different ways of communicating with the health system in the function of health education and prevention of cardiovascular diseases in Serbia.

Keywords: cardiovascular disease; health education; sex-specific risk factors; telemedicine; prevention